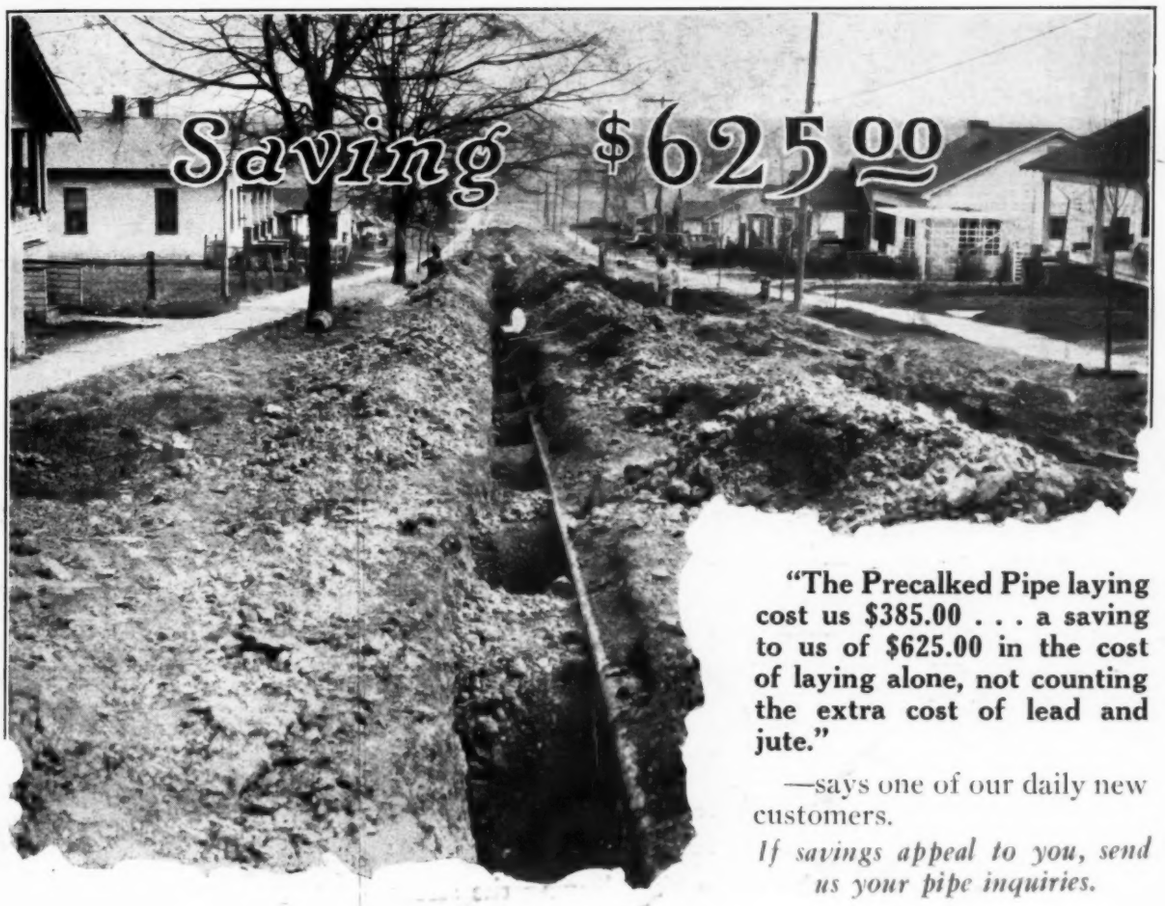
PUBLIC WORKS

CITY COUNTY STATE



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—says one of our daily new customers.

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Sizes: 1¼ through 8 inches.

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608 Subway Terminal Building
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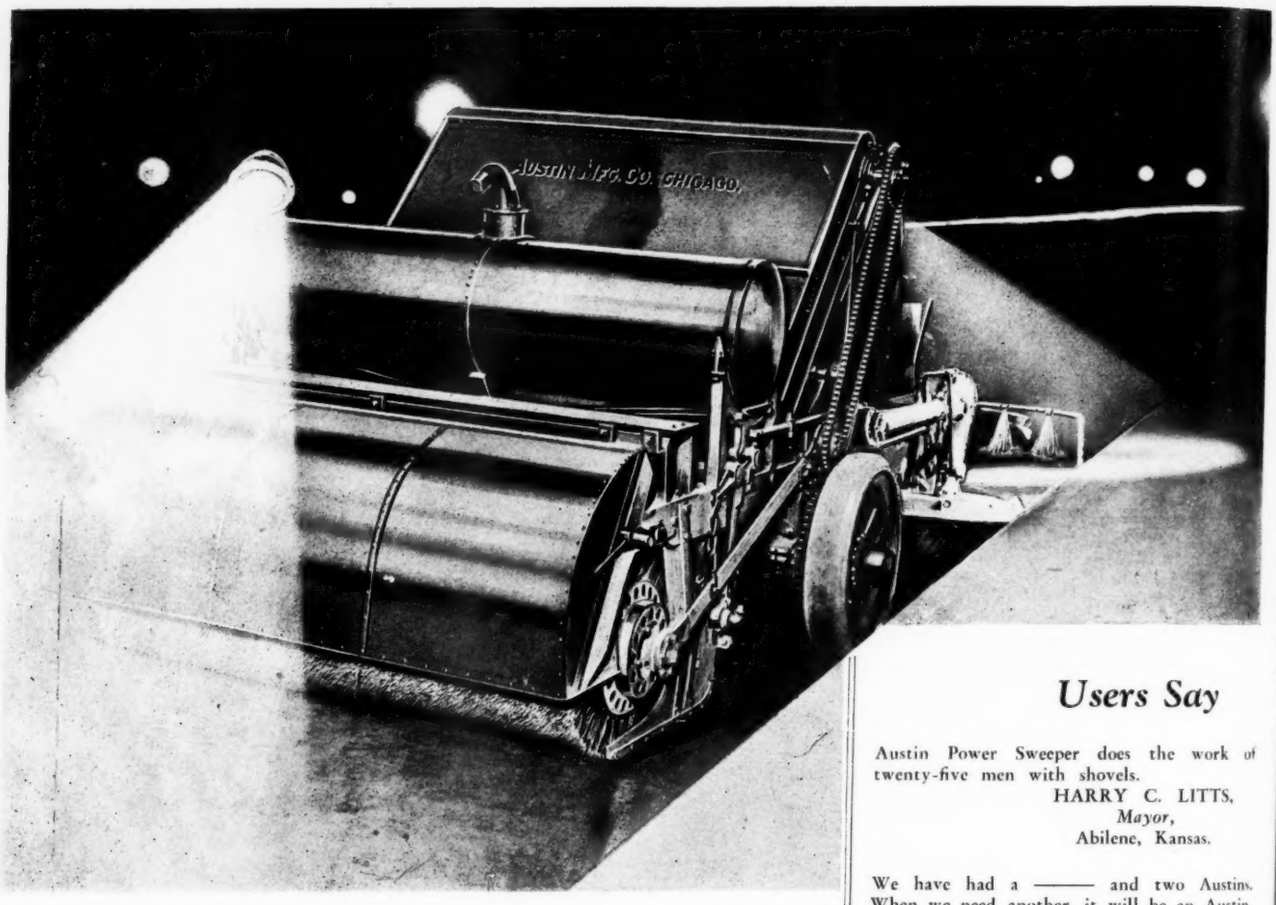
611 Spalding Building, Portland, Oregon

SEPTEMBER, 1927



Why Talk Costs In the Face of Death

Put it up to the Health Department. Let them tell you how much street filth costs.

Of course, it is fine to know Austin Sweepers clean your streets far more economically than hand labor, but the all-important fact is—your streets are not superficially dusted, they are cleaned. Cleaned of all the germ breeding spots of corruption.

The action of brooms—far more powerful than any humanly wielded broom—gets down under the surface leaving the street with a cleanliness reflected in the sparkling eyes of the youngsters whose health and lives it is your duty to safeguard.

Hundreds of cities such as these few quoted here, have seen the value of this form of sanitation.

In the interest of health, write for our Austin Motor Pickup Sweeper Catalog.

THE AUSTIN-WESTERN ROAD MACHINERY CO.

400 N. Michigan Ave., Chicago, Ill.

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Austin Power Sweeper does the work of twenty-five men with shovels.
HARRY C. LITTS,
Mayor,
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We have had a ——— and two Austins. When we need another, it will be an Austin.
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Superintendent of Public Works,
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Five years old, giving best of service.
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I prefer the Austin Sweeper to any other. Upkeep is less.
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When we buy a new sweeper, it will be an Austin.
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Perfectly noiseless.
C. McDONALD,
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Cleaner streets. Less labor trouble. More sanitary.
FRED D. GRANNIS,
Superintendent of Streets,
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No dust in sweeping with Austin. 50% to 75% cheaper than by hand.
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Director of Public Works,
Wilkensburg, Pennsylvania.

In the 1926 season we swept 1,046.84 miles of streets at $0.00052 per square yard. This includes every item of expense.
W. T. TISHER,
Commissioner of Public Works,
Duluth, Minnesota.

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PUBLIC WORKS.

CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"

Vol. 58 September, 1927 No. 9

Two New England Purification Plants

Rapid sand filters, aerators and chlorinating plants for treating supplementary surface supplies of Meriden and Wallingford, Conn. Chief purpose to reduce color, bacteria and algae tastes and odors.

Meriden, Conn., is now engaged in constructing a five-million gallon filter plant and Wallingford, Conn., has just completed a one-million gallon plant designed to allow for future additions. Both of these cities have existing supplies of good quality, but not sufficient in quantity during periods of dry weather. The Meriden plant probably will not be operated continuously; the Wallingford plant is operated only during low stage periods in the present supply.

The new plant, which is now under construction, will consist of an aerator, coagulation basin, six rapid-sand filters, and chlorinating equipment.

Water comes to the plant from a reservoir located about 500 feet up stream, by a 30-inch main, and is carried into the plant through a 20-inch line. Provision is made for by-passing the water, but leakage of raw water through the by-pass is guarded against by double check valves with a 1½-inch bleeder pipe. The low water elevation behind the

OPERATING ROOM, CHEMICAL TANKS AND ONE OF THE FILTERS, WALLINGFORD

THE MERIDEN PLANT

Meriden is a city of about 40,000 population, and is supplied with water from two sources, the Elmere and the Merrimere. These will provide in the future about two-thirds of the daily consumption, while the new Broad Brook supply will provide the remainder. At present, the consumption is 100 gallons per capita daily, or about four million gallons per day.

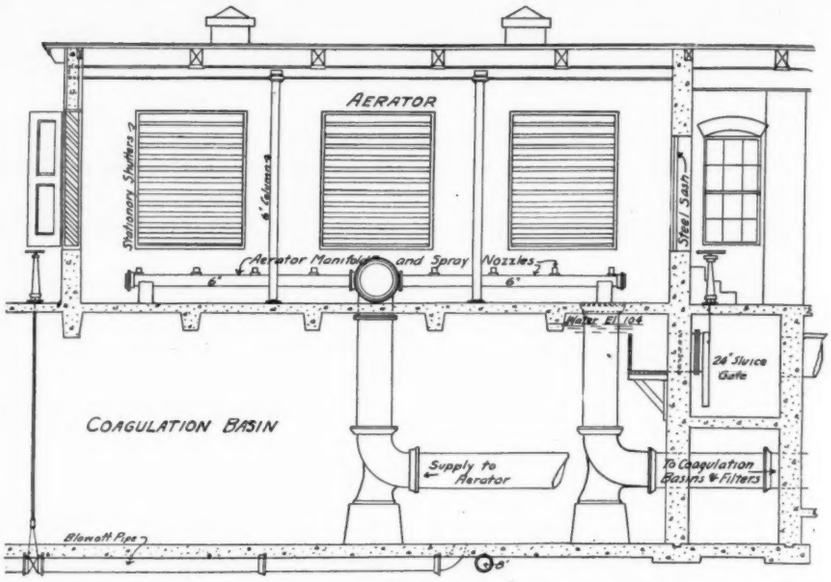
dam is 116 and the elevation of the overflow of the dam 119 feet. From the intake pipe, the water is conveyed under hydrostatic pressure through a 20-inch pipe to the aerator.

Aerator: The aerator, which is 32 feet by 31 feet 9 inches, is located over a part of the coagulation basins and at sufficient elevation to provide gravity flow through the plant from the aerator. The elevation of the aerator nozzles is approximately 107;

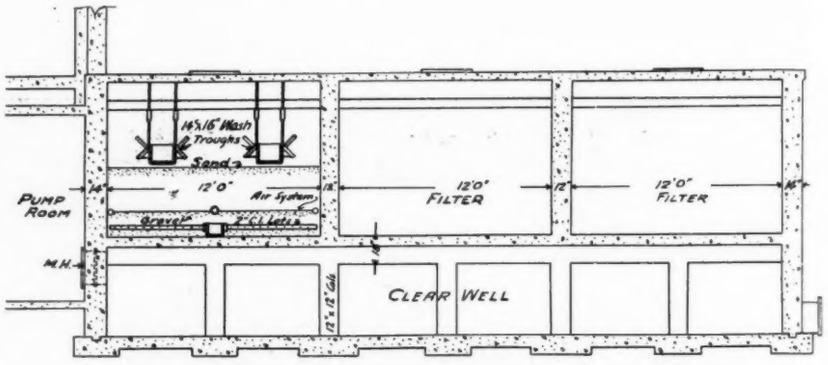
the loss of head in the pipe from the dam is about 0.3 ft. under usual conditions, thus giving an operating head on the aerator of about 8.7 feet at low water, and 11.7 feet at high water. There are 76 2-inch "Sprayco" nozzles, each with a rated capacity of 50 gallons per minute, or 5.47 m.g.d. at the maximum head of 11.7 feet; while under a head of 8.7 feet the discharge per nozzle is 43 gallons per minute, or 4.7 m.g.d., and at 9.7 feet head, the discharge will be 5.0 m.g.d.

The nozzles are screwed into 6-inch laterals joined to a 20-inch main. Laterals are 3 feet 6 inches apart, and the nozzles 3 feet 3 inches apart on the laterals, forming triangles with a base of 3.25 feet and a height of 3.50 feet.

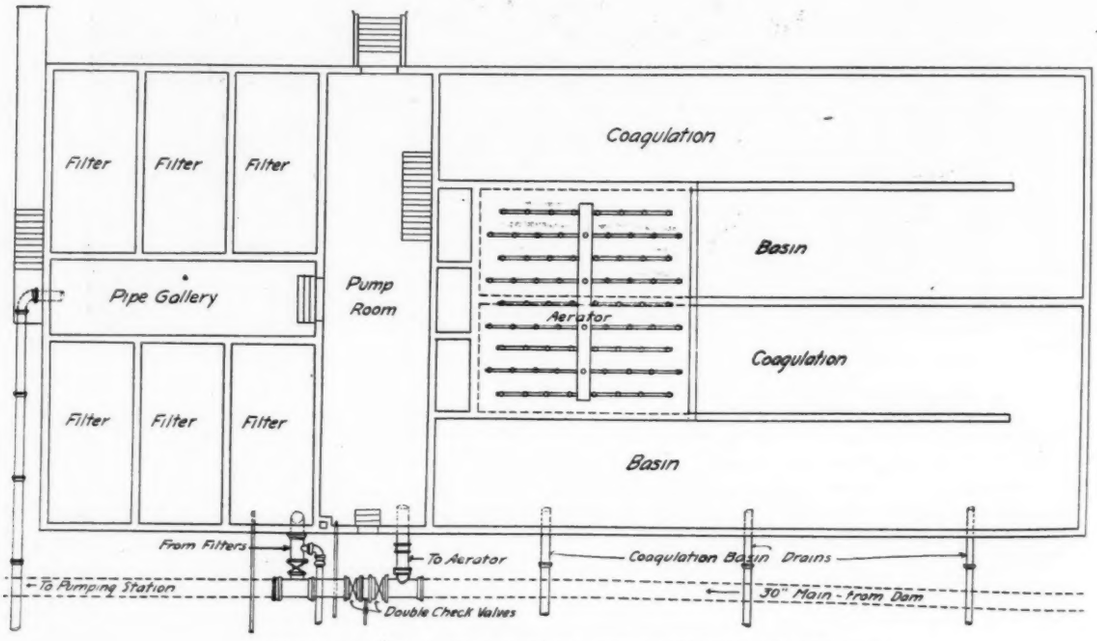
Chemical Treatment: Tanks for the preparation and storage of soda and alum solutions are to be provided, though it is hoped that alum only will be required in operation. The chemical solutions are to be introduced into the water by an automatic proportionate feed device at the throat of the Ven-



LONGITUDINAL VERTICAL SECTION THROUGH AERATOR, MERIDEN



LONGITUDINAL VERTICAL SECTION THROUGH FILTERS AND CLEAR WELL



GENERAL PLAN OF MERIDEN PURIFICATION PLANT

turi meter in the line between the aerator and the mixing chambers in front of the coagulation basins, to which the water is conveyed by a 20-inch line following aeration.

The mixing chambers are to be provided with staggered baffles for the complete admixture of the chemical solution and the water. At periods of operation at full capacity, the detention period in the mixing chamber is about 10 minutes.

Coagulation Basins: There are two coagulation basins, each 92 feet long by 31 feet 9 inches wide, with a longitudinal baffle requiring the water to travel about 180 feet during the detention period. These have a depth of 12 feet and the channel widths are 15 feet 4½ inches. The detention period with the plant operating at its rated capacity is about 2 hours and 20 minutes. The surface area of each unit is 2,740 square feet and the rate of introduction of water is 912 gallons per square foot per day.

Blow-offs for sludge from the coagulation basins are placed at intervals of about 30 feet along the floor, each blow-off serving an area approximately 30 feet long and 15 feet wide. Flat floor slopes are provided sloping toward these blow-offs, which are normally 8 inches in diameter, the slope being at the rate of 3 inches in 15 feet.

Filters: From the coagulation basins, the water flows by gravity to the filters. The velocity in the pipe leading to the pipe gallery will be 2.7 feet per second, and in the 10-inch branches to the filters, about 2.4 feet per second.

There will be six filters, with a total surface area of 0.04 acre; at the rated plant capacity of 5 m.g.d., the rate of filteration per acre per day will be 125 m.g.d. The filters will consist of 30 inches of sand over 10 inches of graded gravel. The sand is required to have an effective size of .30 to .40 m.m., and the uniformity coefficient to be not greater than 1.65.

Each filter is to be 12 feet wide by 24 feet 4 inches long, giving 292 square feet of surface area. The collection system will consist of cast brass strainers, placed 6 inches on centers, in 2-inch cast-iron laterals also placed on 6-inch centers. Manifolds are 8 inches. The strainer openings total 0.25 per cent. of the filter area, the laterals 0.72 per cent. and the manifold 0.312 per cent.

Air piping, consisting of brass air tubes spaced 4 inches on centers, will be placed over the gravel bed to assist in washing. Air will be supplied at 4 pounds pressure at the rate of 2 cubic feet per minute per square foot of filter area. An air blower of 586 cu. ft. per minute capacity, sufficient for washing one bed at a time, will be provided. Blow-offs will be provided to empty the pipes of unfiltered water before a new filter run is started. The air pipes are to be slotted at 2½-inch intervals, thus spacing the air jets 2½ inches one way and 4 inches the other way. Under usual conditions, a loss of head of 8 feet is available in the filter, but it will be possible to secure 10 feet loss of head in actual operation if necessary.

AERATING CHAMBER, WALLINGFORD PURIFICATION PLANT

Washing: The rate of application of wash water will be 8 gallons per square foot per minute, giving a rise of about 13 inches per minute. The wash water pump has a capacity of 2,350 gallons per minute. Each filter has two wash water troughs. Each trough has an area of 1.55 square feet, and the velocity of wash water through the troughs while washing at 8 gallons per minute per square foot will be about 1.7 feet per second with the trough full. The lateral draw will be 22 inches and the troughs are to be placed 15 inches above the surface of the sand.

Clear Well: The clear well will consist of two chambers about 4 feet deep, each with a capacity of 29,000 gallons. When the pumps are running at 5 m.g.d., the water in the clear well provides a supply sufficient for about 17 minutes pumping.

Gauges and Controls: Loss of head gauges will be provided on operating tables for each filter, and there will be a gauge indicating the height of water in the clear well. A continuous record of the water pumped will be secured by present equipment already in use at the pumping station. All valves will be hydraulically operated. Water for this purpose will come from the discharge side of the main pump.

Chlorination: A Wallace & Tiernan vacuum type chlorinator will be provided and all water will be chlorinated after filteration.

Valves will be provided for by-passing the aerator and also for by-passing the entire plant, which is necessary since the plant is to be operated only a portion of the time. Duplicate gate valves with a drip valve will be provided to effect a safe and complete disconnection between the raw and filtered water lines.

The Broad Brook filter plant was designed and is being constructed under the supervision of C. Perry Prann, city engineer of Meriden.

WALLINGFORD PUMP ROOM, SHOWING WASH WATER PUMP AND BLOWER, AND CLEAR WATER PUMP

THE WALLINGFORD WATER WORKS

With a population of 12,350 supplied with water, and an average daily consumption in 1926 of 1,362,490 gallons, equal to 110 gallons per capita daily, there have been threats of water shortage in Wallingford, Conn., in the past, notably in the years 1925 and 1926. To obviate this danger provision has been made for taking a supplementary supply from Pine river and a filtration plant has recently been constructed for purifying it. It is estimated that this supply will be sufficient for the next seventy-five years. The new filtration plant was completed ready for service last December.

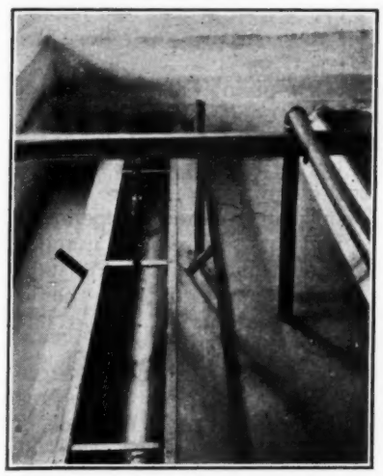
Pistapaug pond and Lane's pond have provided water for Wallingford for many years. The total watershed area of these two sources amounts only to 1¼ square miles, and the total storage is 1,222 million gallons, of which 700 million gallons is available for use. The average draft has been 1,150,000 gallons per day per square mile of watershed, reaching 1,257,000 gallons during one year.

Pine river, which yields water of good quality, has a drainage area above the intake of 8.8 square miles, and it is estimated that during 9 months of the year it will yield about 4 million gallons per day without storage, while during the summer months about 2 million gallons daily will be available. The filtration plant is located about 200 feet from the river and within 400 feet of the present pipe line from Pistapaug pond, thus making use of present facilities and avoiding the necessity for extensive new main construction.

The water from Pine river is diverted by a low dam to the suction well, whence it is pumped to aerators, from which it flows by gravity through the coagulation basins, and filters, and is pumped into the present main.

A coarse bar screen at the intake prevents the entrance of large objects. From the intake, the water flows by gravity through an 18-inch tile intake line to the suction well. The intake line is laid on a concrete base and surrounded with crushed stone, the bottom part of the joints being left open so as to allow the inflow of ground water. The suction well is equipped with a ⅜-inch mesh screen.

Plans for the filter plant call for four half-million gallon filters, with other units of corresponding capacity, but only two of the filters and one unit



WASH WATER TROUGH

of the coagulation basin have been constructed. The concrete work for the other filters has been completed, but the drainage system, sand and gravel have not been installed, as it will be some years before this additional capacity will be required.

The aerating chamber, which contains about thirty-six 2-inch spray nozzles of a design specially adapted to give a uniform spray under a low head with freedom from clogging, is located in a corner of the building over the coagulation basin. Each of the nozzles has a capacity of approximately 50 gallons per minute under normal operating conditions. With the present plant, only 16 nozzles are required, and the others plugged.

From the aerator, the water flows by gravity through the mixing chamber to the coagulation basin, which is 19 feet wide, 14 feet deep, and, by means of a longitudinal baffle, provides a flow length of about 100 feet, with an average detention period of about two hours. Under ordinary operating conditions, three-quarter grain per gallon of alum is used and gives good results.

The filters are 10 feet by 18 feet, giving a total filter surface of 360 square feet; at the rated plant capacity of 1 million gallons per day, the rate of filtration per acre per day is approximately 121 million gallons. The filters consist of 30 inches of sand, having an effective size of 0.33 to 0.40 m.m and a uniformity coefficient of about 1.65. The sand is supported by 12 inches of gravel, carefully laid in four graded layers, ranging in size from ¾-inch and ⅝-inch at the bottom to ¼-inch and finer at the top.

The collecting and washing system consists of a cast-iron manifold into which are joined 1½-inch brass laterals, placed 6 inches on centers. Into these are screwed inverted bronze collecting strainers, also on 6-inch centers. On top of the gravel layer is placed the air-blowing system for aiding the washing process. This consists of a 2-inch main brass feed pipe and 5/16-inch brass laterals spaced on 4-inch centers.

BUILDING CONTAINING PINE RIVER FILTRATION PLANT

From the filters, the water passes to the clear well underneath, which is 6 feet deep and holds a supply of filtered water sufficient for one hour's pumping. The filtered water is chlorinated by means of a Paradon DB type chlorinator, the dosage varying somewhat with the condition of the water, but averaging 0.35 to 0.40 parts per million of chlorine.

Alum is used at the rate of ¾ grain to 1½ grain per gallon. It has not been found necessary to use soda ash. A test last winter showed bacteria reduced from 2,200 in the raw water to less than 10 in the filter effluent, with B coli negative in 10 c.c.; while color was reduced from 27 to 3.

All piping is designed to care for future requirements; the present pumps and pumping units (Worthington centrifugal pumps driven by General Electric motors are used) have a capacity of about 1,250,000 gallons per day. Provision for increased capacity is made so that by installing larger motors on present bases, and changing the pump impellers, double the present capacity can be obtained. The cost of the filtering equipment, structures, tanks and pipe lines was $36,000, while the electrical and pumping plant cost $6,000 additional.

All houses on the Pine river watershed have been provided with sanitary toilets of the vault type to reduce the chance of contamination of the water.

The plant was designed by W. A. MacKenzie, superintendent and engineer of the Board of Water Commissioners of Wallingford, in conjunction with the Norwood Engineering Company of Florence, Mass., and was constructed by the latter company under the supervision of Mr. MacKenzie. The Board of Water Commissioners consists of Charles Nearing, Evart C. Stevens, and Jonathan H. Child.

Chemical Reactions in Water Purification

In a bulletin issued by the Illinois State Water Survey is given the result of investigations of chemical reactions involved in water purification made by four students of the University of Illinois, each of whom reported his results in a thesis for an advanced degree in chemistry. These results are summed up in the bulletin as follows:

"It is believed that these investigations, together with those carried on in other laboratories during the last five years, have definitely established several important points: (1) The amounts of residual alum in filtered water under ordinary conditions are inconsequential and are never sufficient to cause any physiological effect. No economic loss can be inferred from the presence of such slight traces of alum in distribution mains; (2) the saving that results from adjusting the pH to an optimum point is due to the greater efficiency of the alum used rather than to the prevention of unused alum going into the distribution mains. This efficiency consists largely in the formation of better alum floc, which is the first prerequisite in the purification process. It is, therefore, generally desirable to adjust the hydrogen-ion concentration of a natural water to an optimum point; (3) The optimum point is not the same for all waters and can be determined in a given case only by taking account of all the factors

(physical as well as chemical) entering into the purification process and by considering all the circumstances of the case. An operator may find that the optimum point for his plant varies with seasonal changes in temperature, turbidity, hardness and other factors; (4) the use of pH determinations in the operation of a filter plant affords a guide to more efficient results only when there is no confusion of purpose. For example, other things being equal, pH 5.5 may afford most rapid formation of floc, pH 6.2 may be most effective for removal of color, pH 5.9-6.8 may give least residual alum, and pH 7.1 may be best for removal of turbidity. It is, therefore, unwise to attempt to accomplish too many different purposes at one time. Separate treatment may yield better results; (5) the great complexity of the reactions involved in water purification is just beginning to be appreciated. Progress requires the utmost cooperation of engineers, chemists, and operators in the handling of problems of design and dosage. Great economies are yet to be effected. Continued research, looking toward solutions of these problems, is indispensable from the point of view of the general public."

Dramatizing Water Works Reports

How to make them interesting and instructive to the average citizen.

In a paper with the above title presented before the Montana section of the American Water Works Association, J. R. Cortese, superintendent of the Water Department of Livingston, Montana, gave some ideas concerning water works reports which may well serve as a supplement to the editorial in the July issue of Public Works.

Mr. Cortese says that whether the money spent in publishing water works reports is well spent depends upon the report. "Water works reports reflect exactly what the superintendent or manager is. Invariably a good superintendent issues a good report. When one examines, as I have recently, a report that contains page after page of fire hydrant location, and another report where pages were devoted to statistics fifteen to twenty years old, it does not require an efficiency expert to figure out the loss and waste of time and money by issuing such a document. The printer's proofreader was probably the only person who read the entire document.

"A water plant is one of the chief assets of a city; in value it ranks well towards the top of all the city investments, whether owned by the city or company. . . . If the city owns the enterprise, every citizen of the town is a stockholder and therefore a report to the public is due; and the public, further, has a right to demand a real water works report in keeping with the importance of the utility.

"Reports, like people, are often judged by appearances and therefore it should have an attractive cover and be of a good quality of paper and printing. Like a girl's skirt, it should be long enough to cover the subject, yet short enough to be interesting. The pictures accompanying a magazine article always produce a desire to read the article, and photographs and cuts should be used freely to relieve the monotony in text statistics.

"A brief historical sketch, giving date of purchase or date when built and the present value of the property, is always of interest to new customers. Statistics are rarely read by the layman and should be converted into graphical diagrams, which are understood at a glance. A concise tabulation of operating costs, annual revenue, fuel costs, increase in number of connections, etc., shown by both figures and graphical charts, are always interesting but should not cover more than a ten-year period, as old statistics are of little interest or value.

"A population curve and water construction curve are always well worth the making, as they show what future provision for growth should be made.

"A plain statement from health authorities regarding purity of water, with percentage of bacteria removed, with cuts or illustrations of bacterial comparison of raw water and treated water, is the best kind of advertising a report can contain. . . . People always like to know how their money is spent and a graphical diagram showing what part of a dollar goes for interest, labor, fuel and operation is enlightening.

"Illustrations showing losses by leaking faucets, bad plumbing and unregulated flush tanks are helpful in bringing about reforms. Such illustrations are convincing in showing customers how much their own bills could be reduced by eliminating wastage.

"The reduced pumpage, fuel or power bills and increased revenue by a universal meter system are features that can and should be shown in every water works report, for even in this enlightened day we find a few communities which still sell, or rather give away, water without meter measurement.

"The report should show, or account for, the loss between water delivered and water sold, and if this does not show a yearly improvement, something is radically wrong and needs correction.

"A water works plant is never finished or completed and the needed extension, betterments and improvements ought always to be prominently shown in a report; then there will be no shocks or surprises. If bonds are needed there is nothing gained by concealing the fact. Show in the report why the improvements are needed and what advantages and results will be gained by them.

"Every report ought to show the cost of delivering water per 1,000 gallons, including interest, depreciation, sinking fund reserves, etc. This information is not always known by the superintendent himself and when he figures it out, he will, in many towns, find that large users, railroads especially, are getting their water at less than the cost of production.

"A report is of much advertising value to the entire community, so much so that many commercial clubs are joining in the expense of printing and circulating water works reports. Every live water works superintendent knows the advertising value himself of getting out a good report. It places him in a favorite light before many other communities where opportunities for advancement exist.

"The educational value is of greatest importance. It acts as an aid in getting bonds for needed im-

provements, as a basis for arguments for equalizing rates or in securing a raise of rate.

"A report, to be of any value, must be interesting, for if not interesting it will never be read. . . . Extracts from reports are desired by the local papers and should be given to them. Exchange your reports with the officials of other cities of your state."

Columbus, O., Water Works

During the year 1926 the amount of water pumped to the city of Columbus, Ohio, was 5.2 per cent greater than in 1925. The average annual increase during the past five years has been 6.2 per cent. The total per month varied from a minimum of 25.27 million gallons in April to a maximum of 31.13 million in July. Classified by the days of the week, the average for Sunday was 24.02 million gallons; Monday, 28.53; Tuesday, 28.28; Wednesday, 28.46; Thursday, 28.19; Friday, 27.92; Saturday, 27.36. The average per day was 96.1 gallons per capita.

The cost per million gallons was: For interest and annuities, $60.62; purifying and softening, $24.01; distribution, $29.45; pumping, $14.45; office, $5.28; supply, $2.77; returned water rents, $0.42; total, $137.00. The water rents received averaged $118.60 per million gallons pumped to the city. The selling price of the water was $160; therefore 74 per cent of the water pumped was revenue producing. Of the remaining 26 per cent, 6 per cent was supplied, through meters, to the board of education, to the various divisions of the departments of public safety and service, and to forty or more hospitals and charitable institutions. The remaining 20 per cent was used for fires, was underregistration of meters, or was lost by leakage.

The active services in use totaled 52,979; meters, 52,484. This shows 99.03% of the services metered. The percentage has exceeded 99 for three years past, and 90 since 1909.

The cost per foot of laying water mains last year was: for 4-inch, $1.62; 6-inch, $2.07; 8-inch, $2.51; 12-inch, $3.94; 16-inch, $6.87; 24-inch, $10.89.

The cost of operation and maintenance for purifying and softening was $64,208 for labor and $174,956 for other costs; and for pumping, $72,303 for labor and $58,604 for other costs. Of the chemicals used for purifying and softening, 7,688 tons of lime cost $6.37 per ton and 3,063 tons of soda ash cost $29.75 a ton; the total cost of both being $140,097. The total cost for lime, soda ash, alum and chlorine was $16.22 per million gallons of water treated.

"Under the assessment plan for laying permanent water mains, the first of which were laid during the year 1923, there has been constructed 158,537 feet of pipe lines for streets petitioned direct to the division of water, or those where improvements of streets were not requested in connection therewith, and in this footage is included 30,719 feet laid during the year 1926. In streets undergoing permanent improvement, and which is included in the cost of these streets, through the division of engineering, there has been laid a total of 183,287 feet of pipe, included in which is 79,544 feet laid during the year 1926." Of the total cost of the latter, 77½ per cent has been assessed against the property. Of the total cost of the former during 1923, 1924 and 1925, 61 per cent was so assessed.

South American Highway Notes

The following notes concerning highway construction in South America are furnished by the Department of Commerce under date of July 18th.

Peru is constructing, through an American (United States?) contractor, the second concrete highway to link Lima with its seaport Callao, 12 kilometers (about 7½ miles) distant. This road, known as Avenida La Union, was begun the latter half of April and should be finished by September. A concrete road from Lima to Chosica is progressing steadily.

The Peruvian government reports that 8,000 kilometers of dirt roads are now under construction, an amount equal to the length of roads now in service.

The Ecuadorian government has decreed an appropriation of 1,378,000 sucres ($275,600) for road construction and repair in the provinces of Guayas, Esmeraldas, Los Rivers, El Oro and Manobi.

Common Faults in Filter Plant Operation

"Better results are usually obtained from the combination of a poor plant and a good operator than from a poor operator and a good plant," says J. L. Barron, assistant state sanitary engineer of Kansas, in an article with the above title in the official organ of the League of Kansas Municipalities. Stating that there are fifty-six supplies in the state which receive more complete treatment than mere sterilization, that few of the operators have had previous experience with such plants, he said each should therefore all the more study his problems, avail himself of text books and magazine articles, and attend schools for operators where they are available, and endeavor to develop into an expert in his line.

Mr. Barron then offers a number of practical suggestions relative to filter plant operation, which are quoted in full below.

One of the defects in filter plant operation is in the overloading of the operator or superintendent with too many duties. It will generally be admitted that the small filtration plant is not less than a one man job, if it is to be kept in good condition. In several towns the plant is run by one man who also has all of the distribution system to maintain, meters to read and repair, a sewage disposal plant to care for, and in addition, in at least one instance, a power and light distribution system with several miles of transmission line to occupy his spare moments. It is obvious that some of these duties must suffer from neglect and generally all of them have to be slighted somewhat. The result is that the work which appears to be most pressing is taken care of and those jobs which can be put off from day to day are neglected. This may mean a dirty filter house, leaky valves, broken gauges, basins overgrown with algae, and machinery improperly

cared for. In other words, the plant is allowed to depreciate greatly in excess of its normal rate, for which the city ultimately pays, to say nothing of the inferior plant product at the time.

Another similar situation arises where the power plant and the filter plant are combined under one operation. In this case, the superintendent and the shift men are apt to be chiefly concerned with the power plant, the water plant becoming a side issue to be cared for at odd intervals. The average employee in this case seems to use any ambition or desire for knowledge he may have on the power plant, leaving little or no curiosity as to how the river water is made potable. Either the superintendent, or at least one shift man, should be an experienced filter operator. Preferably one man should be assigned to the filter plant only. In the case previously mentioned where one man has too many responsibilities, the city officials would show excellent judgment in dividing the jobs with the requirement that each employee be entirely responsible for the operation and adequate maintenance of the unit under his charge. The writer would like to state here that the running of a filter plant for the man actually in charge is no swivel-chair job but one which requires more or less constant activity about the plant.

CO-ORDINATION OF FLOW

One of the important problems in most plants is the co-ordination of flow between the low and high service pumps and the filters in such a way as to meet a varying demand and maintain the maximum of storage. This problem is frequently complicated by limited hours of operation. For the small plant, it is generally met by providing sufficient storage, both surface and elevated, so that the pumping units and filters can be run at rated capacity during the day.

In the larger plants, where the consumption approaches more nearly the capacity of the plant and the storage is relatively limited, operation over a longer period or perhaps on a 24 hour basis is necessary. The question arises as to the operation of the filters intermittently or continuously at a lower rate. Ordinarily, better results will be obtained by operating a smaller number of filters continuously and at a uniform rate approaching the normal capacity rather than turning them on and off at full capacity.

There are several objections to intermittent operation, in that the sand tends to loosen up with an accompanying disturbance of the filter mat when the filter is shut down. If the period of rest is long, there is opportunity for bacterial growth in the filter bed and also for subsidence in the basin of the floc or coagulant necessary to maintain the mat on the sand surface. It is also unsatisfactory to turn on and off the chemical feeds and try to maintain an accurate control of quantities and rate of dosage.

On the other hand, the filter rate should not be so low as to drop below the range of feed of the chemical machines or orifices. Nor should the loss of head in that case govern the washing of the filters since a long filter run may permit some organic decomposition to take place in the sand, resulting in odors and tastes, or a bacterial growth may occur, counteracting the removal at the surface. It should be pointed out that after a filter has been off for a number of hours, it should be filtered to waste or re-washed as is done after washing. A number of samples run during the past summer indicated on these filters tested that there was a marked increase in the bacterial content in the effluent after a rest of ten hours or more.

FILTER UNITS

One of the most serious difficulties arises in connection with plants that have one filter only. There inevitably comes a time when the filter needs overhauling, involving either a replacement of the sand or a cleansing and repairing of the collecting underdrains, or both. To do a satisfactory and thorough job, this requires a longer time than the filter can conveniently be out of operation. The result is a hurried job with a partial continuance of the very conditions which should have been eliminated. The single filter is also very frequently overloaded and in most of these plants an additional filter unit is seriously needed.

SETTLING BASIN

The settling basin is an important unit in the ordinary treatment plant but frequently suffers for lack of attention. Many operators neglect cleaning the basins, a job which should be done at regular intervals depending on the individual characteristics of the plant and water. A basin should not remain uncleaned for a year, for example, because, during that time there has been only a small amount of muddy water handled. Any deposit of mud and coagulant is likely to be a source of odors and tastes if allowed to remain too long in the basin and it is of course unsatisfactory to permit the storage to be cut down appreciably by such accumulations. On the other hand, too frequent cleaning is a waste of power and labor not justified by results. Frequently operators neglect algae treatment and allow heavy growths to develop requiring a cleaning not otherwise necessary. Frequent cleaning to control algae is generally expensive and inefficient and results in an unsightly appearance of the basin at least a part of the time.

SECONDARY COAGULATION

In the operation of filters, not enough attention is given to secondary coagulation and the maintenance of a mat on the sand surface. Without this "Schmutzdecke" the modern mechanical or rapid-sand filter could never have replaced the old slow-sand filter. The filter is, or should be, the most important part of the purification process and a failure to do its full share shifts the burden to the sterilization treatment. In the ordinary filter we cannot expect effective bacterial removal without a filter mat unless it is operated at an exceedingly reduced rate or with a water already low in bacteria and turbidity. It is unfortunate that in many of the older plants, little or no provision was made for adequate secondary coagulation.

In those plants where secondary coagulation is provided, the time element and thoroughness of chemical mixing are of great importance. If the aluminum hydroxide is not completely precipitated either through lack of time or mixing, it will appear in the filter effluent as a characteristic turbidity. This can be best indicated and measured by the Baylis turbidimeter, the use of which has been demon-

strated in the laboratory sections. It should be kept in mind that temperature of the water is a most important variable and that roughly for a rise of 10 degrees C. in its temperature, the speed of the chemical reaction is doubled. Therefore the operator should observe closely the formation of the floc and adjust the time of mixing, insofar as is possible, to the seasonal temperature variations, either by changing the point of application of the coagulant or the length of travel through the mixing device, as well as regulating the quantity applied.

WASHING FILTERS

Filters which are not washed thoroughly cannot be expected to function properly. It is to be hoped that never again will an instance occur as did last summer when a laborer was found in charge of a filter plant without knowledge of how to apply wash water, in lieu of which he was using a long shiny brass rod with which to puncture the filter and allow water to pass.

The high velocity wash giving a rise of 24 inches per minute is generally dependable in its thoroughness, but the low velocity wash either with or without air agitation has to be watched closely by the operator. If the filter shows a tendency to pack, the operator must get into the filter during washing and break up the hard spots and do this every time if the condition persists. In several of the plants the lack of capacity of the wash water sewer has prevented the use of sufficient water, resulting in a gradual stoppage of a part of the filter area. Clogged strainers or too wide a spacing of the wash-water troughs may bring about the same bad condition. These defects can only be remedied by overhauling or re-building the filter. In the case of unsatisfactory wash using air, the tendency is developing in older plants to raise the wash water troughs and provide a volume of water approaching 15 gallons per square foot per minute.

A common defect in the running of filters is a disregard of the condition or function of the rate controllers and loss-of-head gauges. It is generally true that where the operator does not understand their purposes they are most likely to be out of order. Some mechanical device is of course necessary to regulate the filter flow in accordance with the constantly varying loss of head. This cannot be done with a pinched down effluent valve unless the filter operates considerably below its capacity. It is unfortunate that a number of plants have rather ancient types of controllers which are either mechanically unsatisfactory or through neglect are now beyond possibility of repair. The operator who does not know from his loss-of-head gauge what the initial loss is after each washing is overlooking an important bit of information and if he operates the filter without regard to the loss of head he is probably either wasting wash water or abusing the filter.

CHEMICAL CONTROL

A defect which is very obvious where it exists is the lack or poor condition of the chemical feed apparatus and perhaps the most universal fault, so far as operation is concerned, is the failure to control and regulate the application of chemicals. First of all, the plant must have equipment, either mechanical dry feed, or solution with orifice boxes, or hydrometric control. The orifice box is most frequently out of order because of leaky pipe connections or float valve or because of a worn orifice. Orifice plates are inexpensive and easy to replace. The prevention of leaks is ordinarily a matter of replacing pipes and keeping the lines clean. Yet we frequently find alum and hypochlorite solution being fed through a pinched globe valve, naturally at a variable rate and with only a vague idea on the part of the operator as to the amount in grains per gallon or parts per million.

A further difficulty which is rarely recognized is the tendency of the alum solution to stratify; that is, a variation in the amount of alum in solution from the upper to the lower portions of the tank. This can be shown by use of a hydrometer with the proper range and calibration. This difference in strength of solution is due either to insufficient mixing as the batch is made up, allowing undissolved alum to drop to the bottom of the tank, or to a failure to agitate at intervals after the batch has stood for a time or is in use. As an illustration of this point, the strength of the alum solution was recently checked at three plants with results as follows:

Plant No. 1—Surface of tank, 2 per cent.; Orifice 3 per cent.

Plant No. 2—Surface, 2 per cent.; Orifice, 5.6 per cent.

Plant No. 3—Surface, 1 per cent.; Orifice, 2.9 per cent. After agitation, both, 1.4 per cent.

In other words, at plant No. 3 for example, the alum solution actually being applied was 190 per cent. stronger than that which would be fed at the last of the run, so that if the alum feed were adjusted at the beginning to dose at the rate of one grain per gallon, this would drop to almost a third of a grain at the finish. This emphasizes the necessity of care in making up alum solutions and in agitating at frequent intervals if the solution does not remain uniform. At the Lawrence plant, where a concentrated solution is first made up in a separate compartment run by gravity into the main vat which is then filled and stirred thoroughly, the specific gravity of the solution remains fairly constant throughout.

Because of the general vital necessity of consistent sterilization, chlorinating apparatus is usually given better care than the remainder of the plant. However, for the same reason, its failure is also serious and most plants are warranted in maintaining duplicate installations or at lease sufficient spare parts to effect immediate repairs.

In very few plants are adequate tests performed or records kept. A daily checking of alkalinities is of value in controlling coagulation and is of vital importance if any softening is attempted. The operator must know what the reduction in bicarbonates is, if a uniform quality of water is to be maintained, and also the amount of carbonates if the lime is to be used with economy. When the carbonates begin to build up, the reduction in bicarbonates is partially offset, with the attendant possibility of incrustation of the filter sand and after-precipitation. There is also a possible difficulty in chlorine sterilization in the presence of the carbonates and the accompanying high pH valves, particularly in water of low temperature.

A knowledge of turbidities is also important if

the operator is to accomplish the proper clarification of the water at times of high turbidity. Orthotolodin tests must be made at regular and frequent intervals to determine the amount of residual chlorine if the sterilization is to be consistent and unnecessary tastes prevented. However, residual chlorine tests are not altogether conclusive and should be checked by bacteriological analyses.

METERING DEVICES

As a basis for all operating records, the most essential thing is to know the rate of flow and the total plant output per twenty-four hours. Without this information, the operator cannot regulate chemical dosage, or determine plant efficiency and operating costs. Consequently, the lack of adequate metering devices may be considered a serious defect. There are few businesses of the size and importance of the average public filtration plant which are run with less idea of costs. Operating tests and records are not only of immediate value, but over a long period of time, the mass of information obtained, if properly arranged and summarized, provides a basis of comparison from year to year and indicates good and bad procedure. It is the best way for the operator to pass on his experience to his successors.

ACCOUNTING TO THE PUBLIC

The filter plant operator must keep in mind that he is serving the public in a most important capacity and that the public is or should be interested in his work and in the water plant. He should foster and encourage a general familiarity with the methods of purification and the general conditions surrounding the water supply. If the plant is in excellent condition, the public should realize it. If there are serious deficiencies in its equipment and unsatisfactory conditions existing, an appreciation of the situation on the part of the citizens of the community is the first step toward their correction. The operator must be courteous and more than willing to explain processes and methods and to encourage visits to the plant because understanding will lead to sympathy with the operator's problems and pride in the character of this public utility. School classes should be invited to visit the plant, and open house on holidays or Sundays will result in many visitors. An occasional statement in the local paper that the public is welcome will help in furthering satisfactory relations.

On the other hand, if the city has developed a municipal junk house at the filter plant and the place has taken on the combined characteristics of a garage and livery stable, the average citizen will take little pride in the water works and will probably be more or less doubtful about the quality of the water, however, good it may be in fact. Even if paint and whitewash had no effect in retarding depreciation, it would still pay to use plenty of it in giving the plant a clean and well-kept appearance. Water is food. If a butcher shop or bakery presented the dirty interior that some filter plants do, they would go out of business in a week. The city council will generally yield to the insistence of the water superintendent or operator to clean and beautify the grounds of the filter plant more readily than on any other proposition.

Street Cleaning and Refuse Disposal in Columbus

Flushing Substituted for Hand Patrol. Unit Costs of Cleaning and Method of Calculating Same. Itemized Costs of Collection and Disposal, the Latter Showing an Operating Profit

In his annual report for 1926, H. L. Killam, superintendent of the Division of Street Cleaning of Columbus, Ohio, explains in detail the use made of the appropriation for that division of $240,000, of which $133,026 were expended for labor, $80,058 for other expenditures, and $26,916 was an unexpended balance. The total expenditure was $364 less than in 1925.

A change was made in 1926 from the practice of 1925 in that a great many sections which had formerly been cleaned by hand patrol were last year cleaned by flushing, it being found that flushing three times per week gave as satisfactory results as hand patrol service six times per week on these sections and at reduced cost. In flushing the streets, a large amount of dirt is washed into the catch basins and some of it is carried away by the main sewers. That remaining in the basins is cleaned out by the department and the cost of this is added to the cost of flushing. Under the hand patrol method of cleaning, all dirt is swept into piles, loaded on trucks and hauled to the dumps. The change to flushing resulted in 730 less loads of dirt being hauled than in 1925, the total amount being 14,401 loads, which is estimated to be equivalent to 37,604 cubic yards. This 730 loads is approximately the amount which was carried away by the sewers.

No flushing was done during January, February or December, and only a small amount in March, April and November. The average number of great squares of flushing for each of the remaining months was about 21,000, varying from a minimum of 17,630 in October to a maximum of 24,436 in July. The average total cost per great square for the year was $1.128, of which 26c was for labor and the balance was for foremen, supplies and expenses, stable, yard and building repairs, general equipment repairs, and cleaning catch basins; the apportioned part of the stable cost and the catch basin cleaning being the two largest items. The total mileage of streets on the cleaning schedule for flushing was 222 miles, and the average miles of streets flushed per week was 305 miles, while the miles flushed during the year totaled 10,980.

Forty-one miles of streets were on the cleaning schedule for hand patrol cleaning, and the average miles of streets so cleaned per week was 56, or 2016

miles during the year. The total number of great squares cleaned during the year was 31,707, which was 7,376 less than the previous year because of the substitution of flushing for some of the hand patrol work. The average cost of this work was 42.41c for labor and 90.78c. total, the latter including supplies and expenses, yard and building repairs, general equipment repairs, cleaning catch basins, and office and general expenses.

Alleys in the central part of the city were cleaned by hand, 8,135 great squares being so cleaned at a cost per square of 64.18c for labor only or $1.138 total, the largest item other than labor being office and general expenses, in addition to which there were small amounts for catch basin cleaning, general equipment repairs, and yard and building.

Comparing the labor cost per unit cleaned in 1926 with that in 1925, the average cost per great square of labor alone was 24.47c for flushing in 1925 as compared to 26.01c in 1926; for hand patrol it was 58.54c in 1925 and 42.41c in 1926; while hand cleaning of alleys was 67.95c in 1925 and 64.18c in 1926.

In calculating the total unit costs, the total expenditures under the several schedules of stable, yard and building repairs, general equipment repairs, catch basin cleaning, etc., were apportioned in the case of stables, in proportion to the number of horses used for each service; in the case of catchbasins in proportion to the area cleaned; in proportion to the amount of equipment used, in the case of yard and building repairs and general equipment repairs; and in proportion to the total expenditures, in the case of office and general expenses.

REFUSE COLLECTION

The subdivision of refuse collection, of which also Mr. Killam is superintendent, during the year collected 15,885 loads of garbage, equivalent to 29,972 tons, which is 324 tons more than the previous year. Meantime, the population had increased from an estimated 280,000 in 1925 to 285,000 in 1926. In addition to the garbage, the department collected 8,063 dogs, 2,703 cats, and 245 miscellaneous. The amount of garbage collected per capita was 206.8 pounds, and the cost of collection, including expenditures only and no overhead charges, depreciation, etc., was 47c per capita, or $4.13 per ton delivered at the loading stations, which was 42c greater than in 1925.

The total cost of collecting garbage and delivering it at the loading station was $125,724, of which $79,915 was for labor of collection; $5,551, labor at the loading stations, weigh master, etc.; $15,618 was stable, feed, shoeing, etc.; $6,222 was for supervision, office supplies, etc.; $1,510 was general expenses, coal, gas, electricity, etc.; $8,226 was motor equipment, gasoline, oil, grease, tires, etc.; $7,761 was maintenance of equipment, and $922 was for new equipment. In addition to this, $8,645 was paid as freight on the garbage from loading station to reduction plant. The average daily cost of keeping one horse was $1.315, of which about 36% was for labor, 40% for feed, hay, corn, etc., and the balance for shoeing, veterinary services, harness repairs, bedding, etc.

The total expenditures were partly offset by the sale of 23 carloads and 227 wagon and truckloads of manure which had been collected, for a total of $959.

GARBAGE DISPOSAL

The Division of Garbage Disposal was in charge of W. D. Bee as superintendent, and he reported that the amount received at the plant exceeded all previous records, passing the 30,000-ton mark for the first time. During the past, odors had sometimes been complained of by residents of the end of the town at which the disposal plant is located, but the odors had been reduced to the point where they were no longer noticeable and no complaints were received during the summer of 1926. By the close of the year plans had been completed and all necessary material was on hand for rearranging some of the dryer room machinery so as to produce an improved form of tankage which would be free from fine dust. The changes were made early this year and the new form of tankage is reported to be of excellent condition and very easy to handle.

The total amount of garbage received during the year was 30,614 tons, or an average of 98.12 tons per day; varying from a maximum of 149.47 tons per day in September to 66.92 in March. This gives an average of 214.8 pounds per capita for the year.

From this garbage there was recovered 1,458,901 pounds of grease, 2,382.77 tons of tankage, and 8 hides. This was equivalent to 47.66 pounds of grease and 155.66 pounds of tankage per ton of garbage. (The amount of tankage produced in 1926 was much less than in previous years because, owing to shortage of operating funds, it was necessary to adopt a schedule of minimum hours.) For this there was received $89,174 for the grease, $19,557 for the tankage, $28 for the hides, and $1,340 from miscellaneous sources.

The expenditures for operation per ton of green garbage were as follows: Supervision, 10.71c; clerk hire, 5.09c; operating labor, $1.4995; office supplies, 0.21c; fuel, 55.39c; provisions and clothing, 0.13c; mechanical and motor vehicle supplies, 4.07c; other supplies, 2.49c; chemical supplies, 16.94c; power and light, 13.25c; maintenance of machinery, 48.70c; and telephone and telegraph, insurance, taxes and rent, maintenance of buildings and railroad tracks, and other maintenance brought the total up to $3.155 per ton. As the sales averaged $3.596 per ton of green garbage there was a gross operating profit of 44.1c per ton. There was consumed during the year, per ton of green garbage, 535 pounds of coal, 8.6 kwh of electric current and 0.888 gallon of gasoline.

Gambusia in Italy

The use of small fishes, and especially of gambusia, for keeping mosquitoes under control by eating the larvae, has become standard practice in this country. In 1921 a number of gambusia were sent to Madrid, Spain, and developed there rapidly, and the next year two or three hundred were sent from Madrid to Italy. Here they were divided into four lots and multiplied so greatly that by the following April Lake Porto, which formerly had been filled with mosquito larvae, was then almost entirely free from them. The gambusia multiplied in canals or

other waters in that country, thriving even more than in their native country, the United States. From Italy a number have been sent into Germany, Russia and Jugo-Slavia. Dr. Maximus Sella, from the experience of about three years in Italy, concluded that complete mosquito control is obtainable if there is complete control of vegetation. Vertical vegetation leaves to gambusia the possibility of complete destruction, while horizontal vegetation often prevents complete control. Coincident with the reduction in mosquitoes has been a reduction in malaria.

Austrian Good Roads Conference

On June 15 to 18, the second Good Roads Conference of Austria was held in Vienna and attended by about 400 members of the Good Roads Association and a number of visitors from Hungary and Jugoslavia. The first two days were devoted to a general discussion of the need for better roads in Austria and the various kinds of materials available, advantages of the different methods of road construction, etc.; while the last two days were devoted to an inspection of actual road repair and construction work going on in Vienna and nearby places, some thirty motor buses and motor cars having been chartered to provide transportation for the party. The only American road machine noticed on the inspection tour was one for driving paving stones into place.

No Jury Service for Civil Engineers

In the amended and altered Juries Act which has now passed the Dail of Southern Ireland is a provision granting exemption to corporate members of the Institution of Civil Engineers of Ireland from service on juries, this placing them in the same position as members of the medical and legal professions.

Survey of Ohio's Highway Traffic

Result of investigation by Bureau of Public Roads to obtain essential facts as a basis for planning state highway system to serve present and future traffic. Truck traffic an important factor.

"A knowledge of future traffic, in so far as it can be predicted with reasonable accuracy, is essential in the establishment of a sound plan of highway improvement," says J. Gordon McKay, chief of the Division of Highway Economics of the Bureau of Public Roads, in a digest of a Report of a Survey of Transportation on the State Highway System of Ohio, which has recently come from the press.

The investigation was undertaken in order to obtain essential facts concerning traffic on Ohio highways as a basis for planning the development of the Ohio state highway system to serve present and future traffic. Studies were made of the state, county and township road systems during 1925 under a co-operative agreement between the Bureau of Public Roads and the Ohio State Department of Highways and Public Works. The report is very voluminous, with tables and statistics, and even the digest by Mr. McKay, which is published by the Bureau of Public Roads, is much too long for publication in these columns. but we will endeavor to give, in an abstract of the digest, the principal features covered by the investigation and the conclusions therefrom.

On January 1, 1926, there was approximately 11,000 miles of state highways, of which 5,194 miles was improved with brick, concrete, asphalt, and bituminous macadam surfaces, more than half of which was less than 18 feet wide, and approximately 400 miles were old and worn-out pavements under county maintenance. There was 1307 miles of surface-treated macadam which will require re-treatment or reconstruction when the traffic increases materially. Three thousand miles was gravel, slag and stone, and 1282 miles was unimproved highways.

The principal problems now confronting the state are the reconstructing of the old, worn-out surfaces which are expensive to maintain, the widening of narrow pavements, the improvement of unimproved sections of the state system, the elimination of the most dangerous railroad grade crossings, and the distribution of present highway revenues satisfactorily to complete the state system of roads.

SUMMARY OF CONCLUSIONS

The survey has shown that during the next five years the state should reconstruct 1220 miles of the state system, widen 1594 miles, and build 1707 miles, the latter comprising 1007 miles of construction superior to gravel and 700 miles of traffic-bound improvements. The cost of this is estimated at $100,000,000.

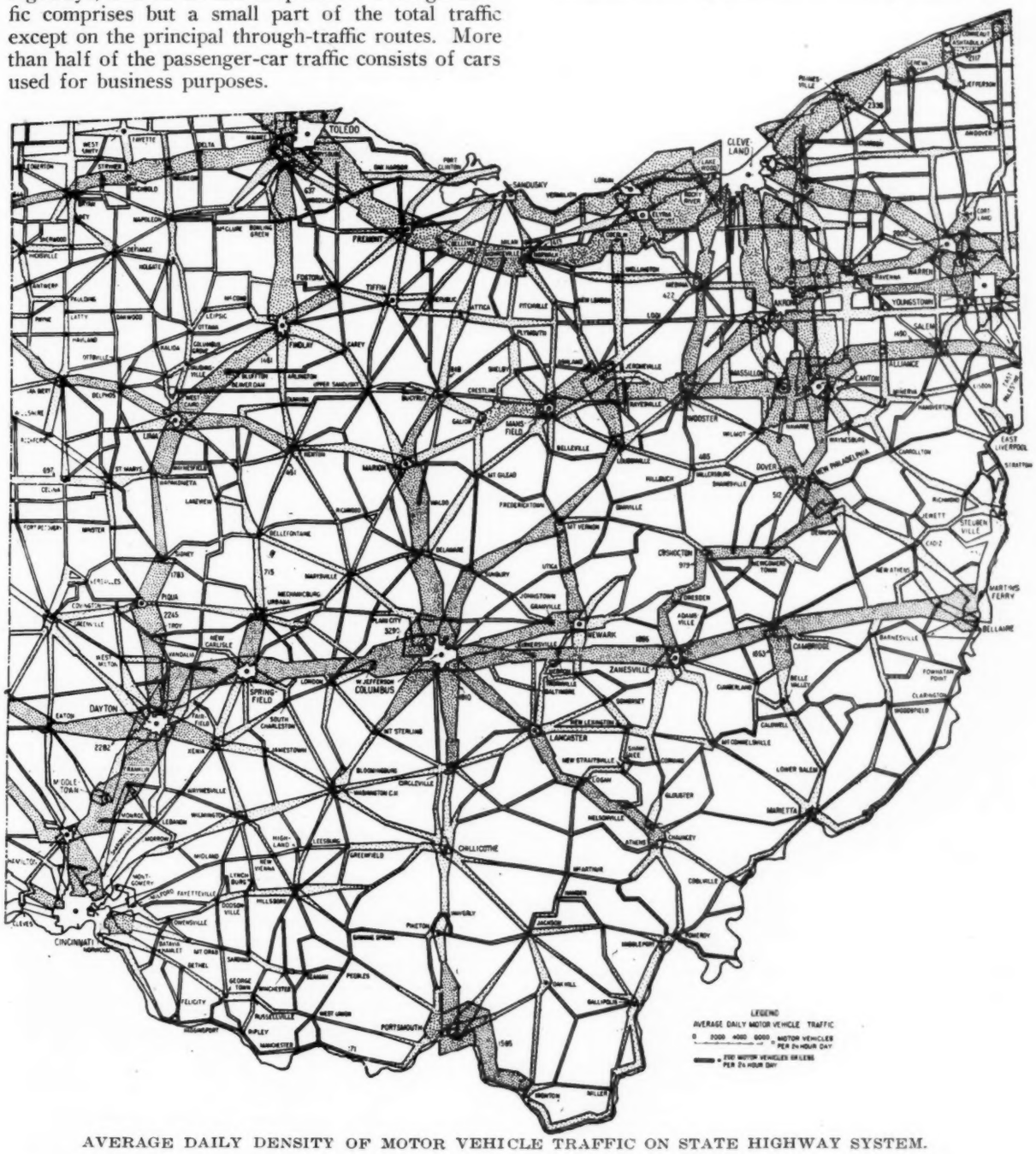
The state highway system, which comprises 13 per cent. of the total rural mileage, carries 57.7 per cent. of the total motor-vehicle traffic on the rural highways of the state; the county highways, which include 27.1 per cent. of the rural mileage, carry 29.6 per cent. of the total traffic, and the township highways, which constitute 59.9 per cent. of the rural mileage, carry only 12.7 per cent. of the traffic. This brings out the great importance of improving the state highway system.

Analysis of the traffic figures for the 11,000 miles of state highway system shows that 1.2 per cent. of this mileage carried 2,500 or more motor vehicles per day, 7.8 per cent. carried 1,500 or more, 29.4 carried 600 or more, and 70.6 per cent. carried less than 600 vehicles per day.

Motor truck traffic is an important part of the total traffic on the principal routes. In 1925, 2.7 per cent of the mileage carried 200 or more trucks per

day, 5.7 per cent. carried 150 or more, 13.1 per cent. carried 100 or more and 27.5 per cent. carried 60 or more trucks per day. Four-fifths of the trucks operating on the state system were small units of 2½ tons capacity or less.

The average daily density of traffic was 538 vehicles on the state system, 132 on the county highways, and 26 on township roads. Foreign traffic comprises but a small part of the total traffic except on the principal through-traffic routes. More than half of the passenger-car traffic consists of cars used for business purposes.

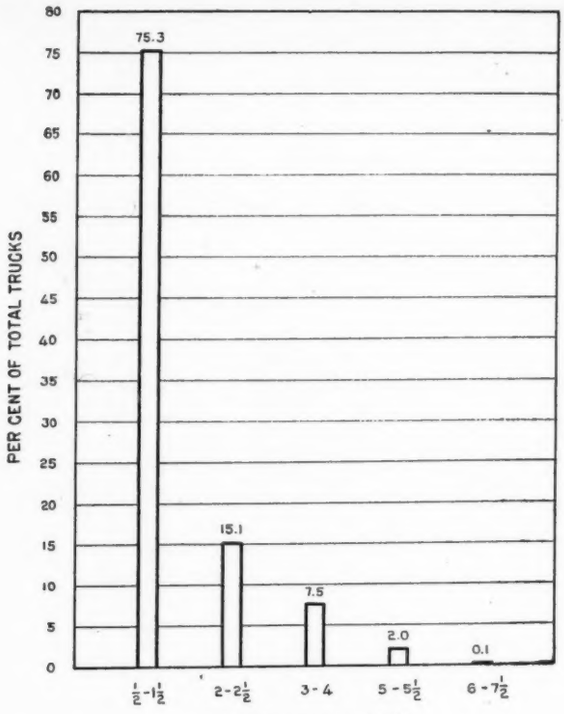


AVERAGE DAILY DENSITY OF MOTOR VEHICLE TRAFFIC ON STATE HIGHWAY SYSTEM.

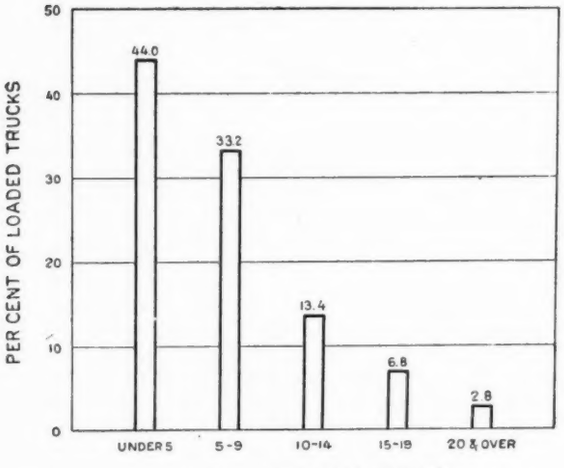
The survey clearly shows that the traffic using the state system is predominantly city passenger-car and motor-truck traffic, farm-owned passenger cars and motor trucks making up only 12.4 per cent. and 15.5 per cent. respectively, of the total passenger-car and motor-truck traffic. It has been found that the volume of traffic in a given area is principally produced by the population residing within the radius of 30 miles, less than 30 per cent. of the truck traffic and less than 40 per cent. of the passenger car traffic traveling more than 30 miles.

ESTIMATING FUTURE REQUIREMENTS

Distribution of population is an important factor in planning highway improvements. In the densely populated areas, the highway systems should be planned to serve large volumes of traffic between the principal centers of population, with tributary feeder routes connecting minor population centers with primary traffic routes. These routes should be



DISTRIBUTION OF MOTOR TRUCKS BY CAPACITY GROUPS.



DISTRIBUTION OF LOADED MOTOR TRUCKS BY GROSS WEIGHT GROUPS.

of sufficient width and improved with surfaces adequate to carry the large daily volume of traffic as directly as possible; obstructions to the free movement of traffic, such as railway crossings at grade, sharp curves, heavy grades, and congested traffic sections, should be eliminated and by-pass routes should be constructed to avoid the traffic congestion which occurs when a main traffic route passes through the business centers of small villages and cities. In sparsely populated areas a smaller mileage of main routes, improved with gravel or the lower types of paved surfaces where traffic warrants such improvements, would satisfactorily meet traffic requirements, except on the main through routes traversing such areas.

As a basis for the plan of highway improvement, the state highways have been classified in three groups designated as major, medium and minor traffic highways, according to their average daily traffic. Routes or sections of routes carrying 1,500 or more motor vehicles per day are classed as major routes, those carrying 600 to 1,500 vehicles per day as medium routes, and those carrying less than 600 vehicles per day as minor routes.

Experience in many states indicates that ordinary untreated gravel and similar surfaces cannot be economically maintained when the traffic exceeds 500 to 600 vehicles per day, and similar experience in Ohio points to approximately 600 vehicles per day as the limit. Above that traffic density, the type and design of surface required are largely functions of the frequency of heavy loads, the choice of types including bituminous macadam for the lower densities and the several rigid types for roads of greater density. On this basis it was found that in 1925 over one-third of the 11,000 miles of the state system required surfaces superior to untreated gravel, and that ten years later, in 1935, approximately half the system or 5,221 miles should be so improved.

TRUCK TRAFFIC AN IMPORTANT FACTOR

Although motor truck traffic is only 9½% of the total motor-vehicle traffic on the state system measured in vehicle miles, it is an important factor in highway traffic planning. The average gross weight of motor trucks using the state system is over twice that of passenger cars and the maximum motor-truck weight is four times the maximum weight of passenger cars. Moreover, the cushion and solid tires with which many motor trucks are equipped are much less effective in cushioning the impact of the wheels than are the pneumatic tires used by passenger cars. It was found that 15% of all trucks using the state highway system are equipped with solid tires and a like percentage with cushion tires, while 95% of the 3-ton to 7½-ton trucks are equipped with cushion or solid tires, on the rear wheels. It is apparent, therefore, that the effect of trucks on the highways is much greater than that of passenger cars. While an improvement sufficient for passenger car traffic will, with few exceptions, be satisfactory for small-capacity trucks on routes carrying less than 60 per day, on routes carrying more than 60, and particularly those carrying 100 or more, the motor truck becomes an important factor.

The Northeastern section of Ohio containing 24% of the total area of the state has an average truck traffic density of 77 per mile per day, while 28%

Average truck-traffic density on State roads in the five traffic sections of the State compared with the relative area of the sections, their truck registration per square mile, and the number of cities over 10,000 population in each

Section	Average truck-traffic density	Percentage of total area in the State	Truck registration per square mile (1924)	Cities over 10,000 population, by population classes [1]				
				Total number	Total per cent	10,000 to 30,000	30,000 to 100,000	Over 100,000
Northeastern	77	24	7.9	22	44	15	3	4
Southwestern	75	6	10.9	7	14	3	2	2
East-central	53	12	2.5	9	18	9	..	..
Northwestern	36	30	2.3	7	14	5	1	1
Southern	36	28	1.3	5	10	4	1	..
Total	51	100	3.9	50	100	36	7	7

[1] United States census of 1920.

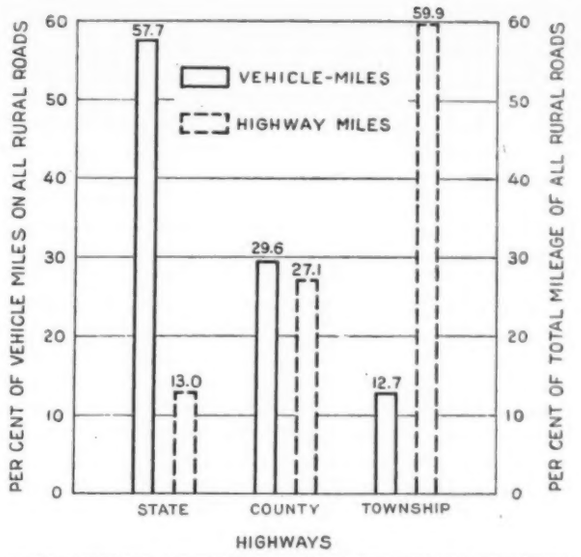
of the area in the southern part of the state has a density of only 36. Routes carrying a large number of motor trucks also carry a large number of passenger cars, and on such routes, unless supplementary highway facilities are provided, serious congestion problems will develop. But the mileage subject to this danger is not large. In 1925 there were only 15 miles of Ohio state highways on which the density of motor truck traffic exceeded 400 trucks per day and only 87 miles where the daily density exceeded 300 trucks.

The relief of congestion which will probably result on a few sections of the state system undoubtedly lies in increasing the width of road and creating separate lanes for truck traffic or in the construction of parallel routes. In either case the segregation of passenger-car or motor-truck traffic would speed up passenger-car traffic and eliminate congestion caused by heavy, slow-moving vehicles.

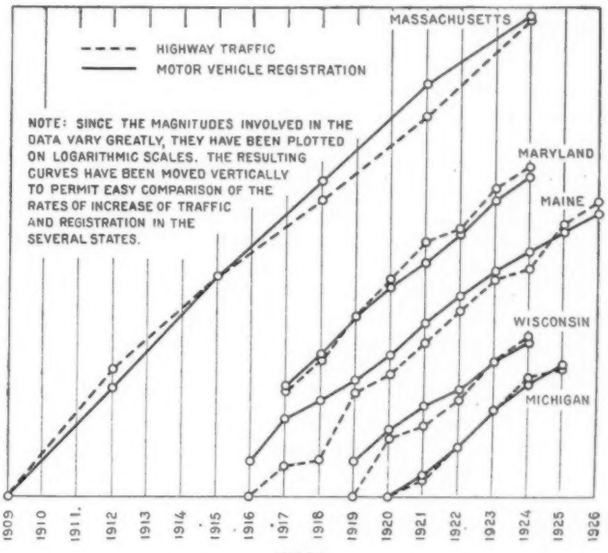
FORECAST OF HIGHWAY TRAFFIC

In order to forecast future traffic, it is necessary to know not only the present traffic but also past traffic in order to determine the trend. Such records were not available in the case of Ohio, but are available for the states of Maine, Maryland, Massachusetts, Michigan and Wisconsin. Highway traffic and motor vehicle registration in each of these states have increased at approximately equal rates. The great variations in industrial and agricultural development, in population, in motor-vehicle registration and in the period of the series, apparently have had no effect upon the relationship between the rate of traffic increase and motor-vehicle registration growth.

It was therefore assumed that highway traffic in Ohio also is increasing and will increase directly with the increase in motor-vehicle registration. This increase is a function of both increase in population, and increase in ownership and use of motor vehicles in proportion to population as measured by the number of persons per motor vehicle. Population increase is readily obtainable from the figures of the



COMPARISON OF TRAFFIC ON THE STATE, COUNTY AND TOWNSHIP HIGHWAY SYSTEMS, AND THE PROPORTIONATE MILEAGE OF THE THREE SYSTEMS.



TREND OF HIGHWAY TRAFFIC AND MOTOR VEHICLE REGISTRATION IN MASSACHUSETTS, MARYLAND, MAINE, WISCONSIN AND MICHIGAN.

Comparison of population and number of motor vehicles in the State of Ohio

Year	Registration (thousands) Actual	Registration (thousands) Estimated	Population[1] (thousands)	Persons per car Actual	Persons per car Estimated
1913.....	86	86	5,095	59.24	59.24
1914.....	123	127	5,197	42.60	40.92
1915.....	181	179	5,299	29.28	29.60
1916.....	252	245	5,402	21.44	22.05
1917.....	347	324	5,504	15.86	16.99
1918.....	413	416	5,606	13.57	13.48
1919.....	511	521	5,708	11.17	10.96
1920.....	621	637	5,810	9.36	9.12
1921.....	721	763	5,913	8.20	7.75
1922.....	859	897	6,015	7.00	6.71
1923.....	1,069	1,038	6,117	5.72	5.89
1924.....	1,242	1,181	6,219	5.01	5.27
1925.....	[2] 1,346	1,329	6,321	4.70	4.76
1926.....	[2] 1,480	1,475	6,424	....	4.36
1927.....	....	1,621	6,520	....	4.03
1928.....	....	1,763	6,628	....	3.76
1929.....	....	1,902	6,730	....	3.54
1930.....	....	2,035	6,833	....	3.36
1935.....	....	2,607	7,344	....	2.82

[1] Population as of July 1 of each year.
[2] Data not available when forecast was made. Estimate differs by 1.3 per cent from actual value in 1925, and by 0.3 per cent in 1926.

Bureau of the Census, while the motor vehicle registration rates also are available. Both of these seem to follow fairly closely to a general law, which permits forecasting for a number of years ahead. The accompanying table shows a comparison of population and the number of motor vehicles in the state of Ohio each year since 1913, with a forecast up to 1935. Similarly, the expected traffic at each survey station was determined by applying the county rate of registration each year to each traffic station in that county.

Industrial and suburban development, as well as changes affecting the present highway system as to location of route, routing of traffic, and detours and conditions of improvement, influence traffic on short sections of highway, and it is not expected that these estimates will in all cases reflect exactly the actual traffic in 1930, but it is believed that they will re-

flect with reasonable accuracy highway traffic on the state highway system as a whole.

In certain areas, particularly areas of sparse population adjacent to centers of population, a very important part of the traffic originates in the centers of population. In such cases a traffic forecast based upon the population and motor-vehicle registration in the sparsely populated area will not reflect the influence of traffic originating outside the county boundaries.

To allow for such variations, and for other reasons, the traffic forecast for 1935 was computed on the basis of the state increase in registration between 1930 and 1935 rather than for the increase in each county. Because of the longer period of time and the greater probability of changes in the rate of population growth in motor-vehicle use and in changes in the state highway system, the traffic forecast for 1935 is expected to be less accurate than the forecast for 1930. It has therefore been applied to highway sections rather than to individual points and is expected to reflect traffic conditions in 1935 within the limits of accuracy required in the establishment of a sound plan of highway improvement.

METHODS OF THE SURVEY

The traffic survey was begun in December, 1924, and continued for one year, during which traffic data were recorded at 1,158 points; one day each month at 358, and at the remaining 800, counts for passenger cars and motor trucks were obtained on three days during the summer months. The data obtained included counts of passenger cars, motor trucks, motor busses, horse-drawn vehicles, foreign vehicles, and detailed trucks and passenger-car data. Motor-truck data included the capacity of the truck, state of registration, place of ownership, origin, destination, type of origin and destination, commodity carried and tire equipment.

At alternate operations at 156 stations total gross and rear-axle weights were measured by means of portable scales. Passenger-car data included State of registration, situs of ownership, purpose of trip, origin, destination, and number of passengers.

Each operation consisted of a 10-hour observation period, alternating between 6 a. m. to 4 p. m. and 10 a. m. to 8 p. m. Special observers tabulated traffic between 8 p. m. and 6 a. m. at selected stations. Complete 24-hour observations were therefore available at these stations, which were made the basis of computation of hourly variations in traffic and of average daily traffic at all stations. Traffic observations for week periods were also made at selected stations to determine variations in traffic by days of the week. Seasonal variations were computed from the monthly operations at all stations. Stations were operated on a carefully planned schedule which permitted operations on the various days of the week and prevented duplicate recording of traffic.

Traffic was observed on practically all sections of the State highway system, and stations were so located as to enable close observation of the variations in traffic on various routes and sections of routes. Stations were also located on representative sections of the county and township highway system in all sections of the State.

During 1925 the density of horse-drawn vehicles was recorded at all survey stations, but it was early apparent that their numbers were so few as to warrant no consideration in highway planning. The average traffic of horse-drawn vehicles on State highways is less than 7 per day.

Motor-bus traffic is important on several of the State routes. It is, however, a specialized movement, and its volume on any highway is the product of several factors which have little effect upon other motor-vehicle traffic. Motor-bus traffic is, therefore, discussed separately in the report, and the term "motor-vehicle traffic" refers only to passenger cars and motor trucks.

Standardizing Road Machine Cutting Edges

The Missouri State Highway Department has suggested to the U. S. Bureau of Public Roads, and the latter has brought to the attention of the Division of Simplified Practice of the Department of Commerce, the advantage of standardization of replaceable cutting edges for grading machines, road maintainers, steel drags and similar equipment. Said the Missouri department: "It would mean a great saving in labor and time, and prove a great convenience if any 8-inch edge would fit any 8-inch mold board, and any 10-inch edge a 10-inch board, etc." It ought also to mean a considerable saving to the manufacturers. The Federal Department believes this simplification would be well worth while, and that it can be accomplished through the cooperation of the State Highway Departments as consumers, and the equipment manufacturers.

Considering the variety of types, sizes, etc., which are at present being used by the several states, and the difficulties caused by the present lack of standardization, there would seem to us to be little question about the convenience to users of such road machines of standardization of replacable cutting edges; but whether the manufacturers will see it in the same light, or whether they can come together on a standard acceptable to all, is another question. At least, we hope that the subject will be taken under advisement by them. If anything is done, it should be done within the next few weeks, before the patterns for next year's machines are made and work begun on next year's output.

Road Across Piney Marsh

Near Columbia, North Carolina, Route 90 crosses Piney Marsh, and for a distance of about 4500 feet the foundation, or lack of foundation, makes construction and maintenance of the highway very difficult. There is approximately one foot of substantial top soil resting upon 40 to 60 feet of wet, sticky muck with poor supporting power. However, the highway has been carried across this stretch in a manner which has proved quite satisfactory.

The road is supported on untreated piles, two piles 17 feet apart to a bent, the bents 18 feet apart. These piles were driven from 40 feet to 90 until embedded in the underlying firm earth, when they were cut off below the permanent line of saturation. The upper two feet of each pile was encased in a cement concrete jacket which extended 8 inches above the top of the pile, and these were

then topped with creosoted timbers 12x12x18 feet long. On these were placed stringers 4x14x18 feet long, held in place with drift bolts, and on these were laid 3 in. by 4 in. by 18 ft. flooring, held in place by being toe nailed to the timber stringers and horizontally nailed to the adjoining piece. Along each side of the foundation so provided was laid a 6 in. by 8 in. timber raised above the floor by scupper blocks 4 in. by 6 in. by 1 ft. long, spaced 4½ ft. centers; these scupper blocks resting on a 1½ in. by 12 in. by 18 ft. strip which rested directly on the floor, the 1½ in. thickness serving to retain the natural rock asphalt wearing surface which was then laid on the flooring. Lag screws were used, passing through the guard rail, scupper block and retaining strip into the floor, to hold the guard rail in place. All of the timbers except the submerged piles were of southern pine treated under pressure with coal-tar creosote with a minimum retention of 18 pounds per cubic foot for joists and caps and 12 pounds per cubic foot for other timbers.

This construction was found to be much less expensive than carrying a fill to the bottom of the soft mud, or any other plan which was proposed. Additional advantages are that, should there be any settlement, the elasticity and flexibility of the timber will absorb considerable movement without serious damage, and low spots can easily be leveled up without difficulty. Also, the timber structure is much lighter than any other form and less likely to produce lateral displacement of the soft subsoil than would a fill.

Laundry Wastes in Sewage

Putrefy rapidly, cause offensive growths, and add enormously to burden on treatment plants. Should be treated at laundry. Acid alum treatment found satisfactory.

The effect of laundry wastes on sewage treatment plants was discussed at the convention of the New Jersey Sewage Works Association by I. Russell Riker, sanitary engineer of the Bureau of Engineering of the New Jersey State Department of Health, and Mr. Simmerman of Pitman, New Jersey.

Mr. Riker stated that they had found for a number of years past that the Monday flow was usually 20 per cent greater than the average flow, and from Monday noon until Tuesday noon of each week the effluent from a sewage plant was usually cloudy, no matter what the type of treatment was, but the plant quickly recovered its normal operation and the rest of the week the effluent was clear. During the past few years there has been a growing tendency to have washing done in large laundries, one laundry sometimes collecting from a large area or even from several municipalities and thus concentrating a large amount of laundry waste into one sewer. On the other hand there is an accompanying tendency to distribute the washing throughout the week.

The refuse discharged from a laundry is grossly polluting material, stronger than ordinary domestic sewage. It putrefies rapidly and may cause offensive growths. An average analysis of laundry wastes shows total solids of over 2000 parts per million, about 3,200,000 bacteria per cc at 37 deg., 277 parts per million oxygen consumed, 80 parts color, 1000 turbidity, 7,500 alkalinity, and 1,400 ether soluble material.

A sewerage system and sewage treatment plant for Oaklyn, New Jersey, with a population of 4,000, was constructed in 1915; the plant, designed to treat 168,000 gallons per day, consisting of coarse bar screens, Imhoff tanks, dosing tank, sprinkling filter, final settling tank, chlorine dosing apparatus and sludge drying beds. For two years the effluent was satisfactory, but in 1917 a wet wash laundry was connected to the system and the plant effluent began to show noticeable effects. In 1921 the State Department of Health made a test run of the sewage plant and found that during the first half of the week the sewage flow reached 150,000 gallons per day, but during the latter half, when the laundry was not operating, it dropped to 75,000 gallons. A test run was made from Monday to Wednesday with samples taken at all parts of the plant. During this time the effluent was cloudy and little purification was being obtained. The Imhoff tank removed only 15 per cent of the suspended matter and the sprinkling filter, although run at a low rate per acre, had very little beneficial effect on the high oxygen demand of the 985 parts per million of total solids. Another test was run in the latter part of the week when the laundry was not operating, and while the effluent had a better appearance and the result of the analyses showed much improvement, the effect of the laundry wastes discharged into the plant during the first part of the week was still noticeable. The Imhoff tank removed 40 per cent of the suspended matter and there was increased nitrification in the sprinkling filters, the amount of nitrate in the effluent being 3.8 parts per million while during the first part of the week they had amounted to only 0.25. (The average nitrate contents of sprinkling filter effluents of the various tanks in New Jersey is from 5 to 6 parts per million, and the removal of suspended solids by Imhoff tanks averages about 60 percent.)

By 1925 the laundry was operating every day in the week and the flow of sewage had increased so that the borough asked permission to increase the capacity of the plant by 32,000 gallons. The State Board of Health recommended that the laundry wastes be given preliminary treatment before they were discharged into the sanitary sewer systems, or that the wastes be removed from the sewer system entirely, treated separately and discharged into the nearest stream. Unless the latter were done the plant, even as extended, would not have sufficient capacity. The borough commissioners thereupon ordered the laundry to discontinue use of the sewer, and it was later disconnected against its protest. It instituted proceedings against the municipality for damages, and Mr. Riker was informed that a national laundry association prepared to back up the local laundry and sent an agent to Oaklyn to study the situation. This was in 1925, and up to the time of the reading of this paper the case had not been brought to trial.

After the laundry waste had been removed from

the sewer system, an improvement in the effluent of the treatment plant was noticed. Another test was made by the State Department of Health on December 22, 1925, when the Imhoff tanks were found to be removing about 70 per cent of the suspended matter, nitrates in the effluent of the sprinkling filter averaged 16.5 parts per million, and the relative stability of the effluent of the plant, by the methylene blue test, was found to be 90 per cent, and the sprinkling filter effected a 78 per cent reduction in the oxygen demand.

Mr. Riker stated that if a laundry is connected to a sewer system the wastes should be treated at the laundry before they are discharged into the system. The state board has found that the acid alum treatment produces a very satisfactory effluent.

Mr. Simmerman described the effect upon two plants in Pitman of for a time admitting laundry wastes to them and later of discontinuing same. One of the plants takes care of about 200,000 gallons of sewage daily and the other of about 100,000 daily. In 1919 a small laundry was started, the effluent of which reached the smaller disposal plant. By the end of the year the effluent from this plant showed noticeably the effect of the laundry waste. Whereas previously the stability test would run full time, at the end of a year it ran down in 6 to 8 days. In 1922 the laundry was moved and enlarged, the effluent then discharging into the larger plant. Here again the stability test ran down in 6 to 8 days, whereas the small plant, about three months after the removal of the laundry, began to show great improvement and in 6 months was giving full stablility tests. In 1923 the laundry began to use chlorine in connection with the wash water and this improved the stability tests so that now these are running from 8 to 10 days.

A few days before the convention, the large plant started going wild, the filter pooling and foam clogging the gas vents and rising 15 inches higher than the water level. Scum was flowing over the top of the wall. Analysis showed that the sewage had an alkalinity of 7.8. Inquiry at the laundry disclosed that the water softener had been moved, which involved dumping a ton of salt and brine into the sewer, which salt accounted for the rise in alkalinity and apparently was the cause of the condition mentioned. During the few days following this event, the plant had come back practically to a normal condition.

Preventing Mosquito Larvae in Water Barrels

A simple expedient to prevent mosquitoes from laying their eggs in water-collectors has been discovered by M. E. Borel, of the Pasteur Institute, Saigon, Indo-China. In a tour of inspection, he observed that in a rain-water barrel encrusted with lime inside, mosquito eggs were absent, whereas another unlimed receptacle, not far away, contained larvae. Subsequent tests showed that neither the pH nor the calcium carbonate content of the water in the two receptacles prevented egg-laying, but a white surface was an effective deterrent. These observations have a great practical value in the case of native water-storage in French Indo-China, for the lining of barrels, jars, etc., every month with white lime is an easy matter, and the solubilisation of calcium carbonate presents an advantage because the waters of this region are very poor in lime salts.

Stream Pollution in Wisconsin

The desire of residents of other states to fish in the waters of the state of Wisconsin is said to be worth at least $10,000,000 annually to that state. Figures collected by the highway commission indicate that tourists entering that state by auto and other means of travel spend nearly $100,000,000 annually in the state, and that 10% of them come because of the good fishing they expect to find there.

This apparently furnishes ample argument from a purely commercial point of view for spending considerable sums in purifying and keeping pure the streams of that state. In addition there is, of course, the desire to preserve the health of citizens and to prevent nuisances from stream pollution.

However, only 31 of the 274 water supplies of the state are secured from surface sources, and 22 of these are from lakes, 14 of them from Lake Michigan; and stream pollution in Wisconsin therefore is not primarily a public health problem. But gross pollution, such as to produce objectionable odors, may affect the comfort of the citizens, and the State Board of Health has been given jurisdiction over waters of the state in so far as they affect comfort as well as health.

The 1925 Legislature appropriated $10,000 annually from the funds of the Conservation Commission to enforce the provisions of statutes in regard to stream pollution, this fund to be expended in co-operation with the State Board of Health. Considerable work was done by these two state bodies during the latter part of 1925 and 1926, and the results have been embodied in a report which has just been made public by the State Board of Health.

"Because of the magnitude and the diversity of the work and the rather limited funds and personnel available, it was decided to concentrate upon certain definite and specific problems rather than endeavor to cover all phases of stream pollution. In general, therefore, the work done consisted of investigations following specific complaint, experiments in regard to the treatment of paper mills and pea cannery wastes," and stream surveys of four rivers.

Potential sources of stream pollution in Wisconsin were found in 212 public sewerage systems, 169 canning plants, 40 coal-tar or gas plants, 2,779 cheese factories, 599 creameries, 89 condenseries, 1,097 receiving stations, 59 paper and pulp mills, and 262 other sources.

Since pea cannery waste and paper mill waste constitute two of the major sources of pollution, work last year was concentrated upon these two. An investigation during the fall of 1925 of conditions in the Flambeau river indicated that waste from a paper mill had been the principal factor in the death of 25 to 30 tons of fish. There seemed, however, to be no other known economical and practical method of disposing of these paper mill wastes, and with the co-operation of W. L. Steven-

son, secretary of the Sanitary Water Board and chief engineer of the State Department of Health of Pennsylvania, and representatives of the U. S. Forest Products Laboratory, a national movement was started for studying the problem of reducing stream pollution by pulp and paper mill waste. Representatives of the pulp and paper industry in Pennsylvania in December, 1925, adopted formal resolutions looking to such an investigation and the raising of the necessary funds. In February, 1926, a national movement was adopted at the national convention in New York City of the American Pulp and Paper Association, and later the executive committee provided for an assessment of $15,000 a year for a period of three years to employ a sanitary engineer to coordinate the work being done throughout the country on this problem and to co-operate with state and federal agencies in the development of methods to so dispose of paper mill wastes as not to cause objectionable stream pollution.

From the investigation carried out in Wisconsin it was concluded that "The installation of suitable saveall equipment will economically reduce the waste of paper making material to approximately ½ pound per thousand gallons of waste. Aeration and impounding of sulphite liquor from sulphite mills will reduce the oxygen demands 50% to 75%."

Experiments in the treatment of pea cannery wastes indicated that "The application of 3¼ pounds of ferrous sulphate and 7¼ pounds of lime per thousand gallons of waste, followed by satisfactory sedimentation, will reduce the oxygen demand approximately 75%. The initial cost of installing the necessary equipment for this treatment ranges from $2,000 to $2,800 for a two line cannery and the cost of operation from $13 to $15 a day. Experiments in the chemical treatment of pea cannery wastes preliminary to entering the sewer system at Ripon demonstrated that the removal of the coagulated solids in the cannery is essential to prevent overloading of the local sewage disposal plant during the canning season."

These and other waste treatment investigations are described at length in 75 pages of the report. About 230 pages is devoted to a description of the methods and results of stream pollution surveys. These are preceded by 25 pages of general information, including a presentation of the chemical, physical and biological principles involved in the problem of stream pollution prevention.

Chicago Sewage Treatment Plants

Plants under construction and contemplated. North side works the largest activated sludge plant yet constructed. West side tanks to digest sludge from north side works. Skimming tanks, Imhoff tanks, sewage and sludge pumps.

THE NORTH SIDE WORKS

Construction of the North Side plant was begun in 1922 and it is expected will be completed in April, 1928. It will serve the northeastern part of the district, including all of Chicago north of Fullerton avenue and all the north shore towns to just beyond Glencoe, a total area of approximataely 78 square miles, and is designed for an estimated population of 800,000 in 1930, with an average sewage flow of 175,000,000 gallons a day and a maximum flow of fifty percent in excess of this.

The plant is located on a tract of 180 acres on the North Shore Channel purchased for the purpose. The sewage is brought to the works through about 14 miles of intercepting sewer ranging from 4 feet to 18 feet diameter and costing about $12,000,000.

The plant is of the activated sludge type, with preliminary settling, and digestion of the excess sludge at the West Side sewage treatment works. The plant comprises a main pumping station and blower house, an outdoor electrical sub-station, grit chambers and coarse screens, preliminary settling tanks, aeration tanks, final settling tanks, operating galleries, main building, service building, 17 miles of force main for conveying the excess sludge to the West Side works, and miscellaneous conduits. It will be the largest activated sludge plant yet constructed, although a still larger Southwest Side plant is contemplated.

Five pumps are provided for lifting the sewage from the North Side intercepting sewer into the plant, and space is reserved for a sixth unit. The pumps are protected by coarse screens with four-inch clear openings. The pumps are single inlet, double suction, horizontal centrifugal units direct connected to synchronous motors and pumping against a total dynamic head of 44 feet. There are two 48-inch units with a capacity of 150 cubic feet per second each, and three units with 48-inch suction and 42-inch discharge having a capacity of 100 cubic feet per second each. Seven blowers of the turbo type, 3,600 r.p.m., are provided for compressing air for aerating the sewage, designed for a rated pressure of 7.75 pounds per square inch with air at 85 degrees and barometer at 14 pounds absolute. Three of the blowers have a rated capacity of 30,000 cubic feet of free air per minute, and four of 40,000 cubic feet. The air used is conditioned in eight units consisting of Vento type heaters, water air washers and oil-coated air filters. Each unit has 1512 square feet of heating surface arranged in two tiers, double decked. The air washers for each unit consist of two banks of spray nozzles, one bank of scrubbing nozzles and one set of distributor and elminator plates. The oil-coated air filters for each unit consist of 56 cells, each 20 inches square by approximately 4 inches deep, arranged in one bank. The air conditioning plant has a total capacity of about 350,000 cubic feet of air per minute. Power for the plant is obtained from the Lockport Power House, a 12,000 volt line, and the Public Service Company of Northern Illinois, 33,000 volt lines.

From the pumps, the sewage passes into grit chambers and through coarse screens, there being 12 chambers each 80 feet long, 8 feet wide and with a flow depth varying from 4 feet in 1930 to 6.6 feet in 1960. At average flow the velocity is 1 foot per second. Following the grit chambers are four coarse screens each 15 feet wide with 1-inch clear openings. An overhead monorail trolley system with an electrically operated grab bucket cleans the grit chambers and a pneumatic ejector system is provided for removing the screenings.

Next the sewage enters eight preliminary settling tanks for removing the oil and scum and for settling out the coarser solids. Each tank is 80 feet square, with a water depth at the center of 13 feet and a detention period averaging 30 minutes. Dorr clarifier mechanisms are used for removing the sludge, and skimmings are removed by hand and conveyed to a grease separation tank in the screen house. The screened and settled sewage then passes to the aeration tanks.

There are 36 aeration tanks, divided into three batteries of 12 tanks each. Each tank is 420 feet long by 32.3 feet wide average, with a longitudinal dividing wall running the entire length and water depth over the diffuser plates of 15 feet. The aeration system is of spiral flow type consisting of two parallel rows of air diffuser plates set in concrete containers extending the entire length of each tank and supplied with compressed air from a pipe distribution system; the plate ratio being 1 to 9.4. The detention period at average flow is 6.3 hours with an allowance of 20% for returned sludge.

There are 30 final settling tanks arranged in three batteries, each tank unit 77 feet square with a water depth of 16 feet at the center and furnished with Dorr clarifier mechanisms; the tanks being designed for a rate of 1180 gallons of sewage per square foot per day at average flow. An operating gallery 420 feet long and 21 feet wide is provided for each battery of aeration and settling tanks, one-story superstructures covering the galleries in which are placed the piping, valves, conduits, and meters for distributing and controlling the flow of sewage, sludge and air through the aeration and settling tanks.

There are four return sludge pumping units, one for each battery of tanks and one to spare. These are horizontal-shaft, centrifugal volute type, single stage, direct driven by variable speed induction motors, the pumps having 30-inch suction and 24-inch discharge, and each delivering approximately 13,500, 8,100, and 5,400 gallons per minute at 10, 7, and 6 feet total dynamic head respectively and about 10 feet suction head. The motors are variable speed 440-volt, 3 phase, 60 cycle, induction motors controlled by a float-operated liquid controller.

The excess activated sludge and the preliminary settling tank sludge will be pumped to the West Side sewage treatment works for digestion, two pumps being used for this, each a horizontal, single suction, motor driven, centrifugal pump with a rated capacity of 1,000 gallons per minute against a total dynamic head of 180 feet and a dynamic suction head of 8 feet. These will pump the sludge through about 17 miles of 14-inch pressure main.

The estimated cost of this entire plant is $17,500,000, of which over $15,500,000 has been placed under contract or expended for land up to date.

WEST SIDE TREATMENT WORKS

The West Side plant, the first contract for which was awarded in the fall of 1926, will serve the central portion of the district containing a total area of about 100 square miles and designed for a population of 1,850,000 people and an average flow of 400,000,000 gallons per day, which is expected by about 1940. The initial installation consists of skimming tanks, grit chambers, Imhoff tanks for settling and digesting the West Side sewage and for digesting the waste sludge from the North Side works, and sludge drying beds. The first unit should be placed in operation in 1928.

The main pumps are similar to those in the North Side works, except that they operate against a head of 68 feet, and two units are of 48-inch suction and 36-inch discharge and five of 54-inch suction and 48-inch discharge.

There are eight skimming tanks, each 105 feet by 66 feet with 11 feet depth of water, providing a detention period of 15 minutes at average flow and designed to remove the oil and other scum forming material and the grit. There will be mechanical equipment of the scraper conveyor type to remove the bottom sludge and surface scum. About 15 percent of the average sewage flow will be drawn off from the bottom sludge and passed through the grit chambers.

There are four grit chambers, each 90 by 8 feet with a flow depth of 5.6 feet for separating the grit from the concentrated bottom sewage from the skimming tanks. The detention period is 1.5 minutes and the velocity 1 foot per second. The grit chamber effluent flows to the main pumping station and is there lifted to the Imhoff tanks. Before entering the skimming tanks, all sewage is screened through five mechanically cleaned coarse screens, each 10.5 feet wide with 1 inch clear openings. The grit chambers are cleaned with an overhung monorail system with electrically operated grab bucket, and screenings will be removed and discharged into cars by a pneumatic ejector.

There are three venturi meters for measuring and regulating the flow of the effluent from the skimming tanks to the Imhoff tanks and three others for the return sewage. The excess sludge from the North Side works is distributed to the influent conduits of the Imhoff tanks by means of an adjustable weir box.

The Imhoff tanks are 108 in number, each 80 feet square with a maximum water depth of 33 feet, divided into three batteries of 36 tanks each. They are designed for a detention period in the settling department of two hours of average flow. Sludge digestion capacity is allowed at the rate of 2 cubic feet per capita for the tributary West Side population and 5 cubic feet per capita for the excess sludge from the North Side. They are designed so that gas collectors and scum withdrawal piping can be added. The pipes, valves and other appurtenances are located in three operating galleries between parallel rows of tanks. Meters and electrically operated valves are provided for regulating and reversing the flow of individual groups of either 6 or 12 tanks,

and three pneumatic ejectors, each with a capacity of 1,500 gallons per minute, will lift the sludge to the drying beds.

Fifty-one acres of underdrained sand drying beds are provided, figured at the rate of 0.6 square foot per capita for the tributary West Side population and 1.1 square feet per capita for the North Side. It is probable that the beds will be cleaned by means of a machine developed by experiments now being conducted at the Calumet works. The dried sludge will be disposed of by dumping on land reserved for the purpose along the main channel, to which point it will be carried by means of a standard gauge railroad with complete rolling stock, with unloading and distributing equipment.

The estimated cost of this entire plant, including land, is approximately, $19,500,000.

OTHER CONTEMPLATED WORK

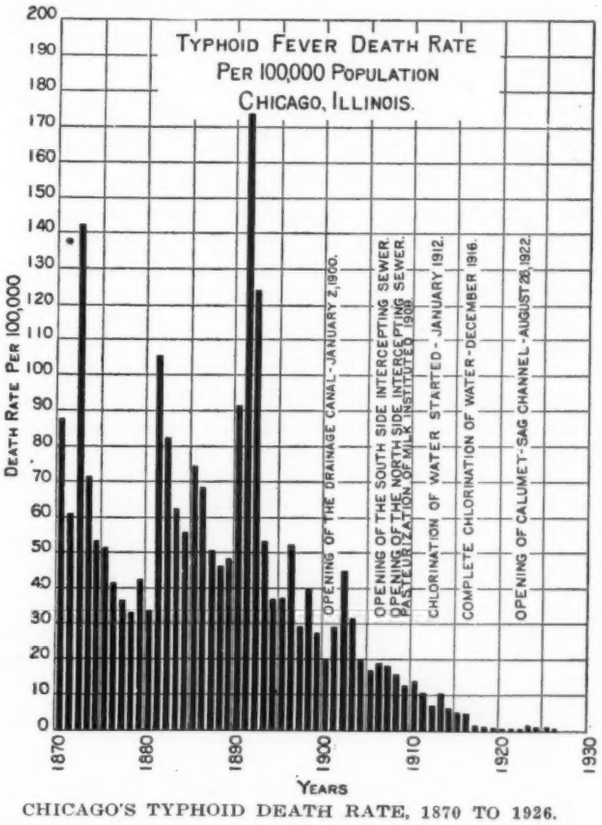
Last of the three major treatment projects to be undertaken will be the Southwest Side treatment works, which will serve the territory lying between the West Side and Calumet projects, with an area of 59 square miles and an estimated population of 1,230,000 when the plant is to be put into operation in 1935. Besides the ordinary sewage, this plant will also treat the concentrated sewage from the meat packing plants in the Stock Yards region, which is equivalent to the sewage of over 1,100,000 persons.

If the activated sludge process is used, this plant will doubtless be the largest one of this type for a long time; if tanks and trickling filters are used it will still be a very large plant. The works will be located along the south bank of the drainage canal directly opposite the West Side treatment works. At present the estimated cost of the Southwest Side project, including interceptors, will be over $36,000,000.

When these several projects have been fully completed as now proposed, all of the sewage originating within the area comprised in the Sanitary District of Chicago will be treated. Extensions of the treatment works are planned to keep pace with the growth of population; also addition of secondary treatment to the sedimentation plants to bring their effluents to nearly as high a stage of purification as is achieved in the activated-sludge plants. These developments will give Chicago the distinction of taking care of its sewage much more completely than any other city of comparable size.

It is hoped in the near future to interest the four cities of Hammond, Whiting, East Chicago and Gary, located in the northwest corner of Indiana, in taking care of their sewage, which now discharges into the Calumet river or its tributaries and often passes through the southeastern part of Chicago on its way into Lake Michigan. All these industrial cities derive their water supply from the lake and doubtless will come to recognize the importance of either cooperating as individuals with the Sanitary District of Chicago or creating a district of their own, to the end that in all the metropolitan area in and about Chicago the water supply will no longer be polluted and the sewage will be disposed of so that no offense is given to other communities or fish life injured.

The engineering work of the Sanitary District of Chicago is being carried on under the general direction of Edward J. Kelly, chief engineer, and a staff including Phillip Harrington and H. P. Ramey, assistant chief engineers; Langdon Pearse, sanitary engineer; F. W. Wohlman, chemist; L. C. Whittemore, engineer of treatment plant design; J. T. Hawley, electrical engineer, and H. I. Steffa, mechanical engineer.



CHICAGO'S TYPHOID DEATH RATE, 1870 TO 1926.

The chief purpose for which the sanitary district of Chicago was organized was that of keeping sewage pollution out of Lake Michigan, which is the source of water supply for the city. The accompanying chart giving the typhoid fever death rate of the city for the past 56 years shows the effect upon this rate of the various improvements that have been made since that date in the sewerage and water supply systems, the pasteurization of milk (which was instituted in 1909) and also probably of other improvements in the general sanitation of the city. The combined effect has been a reduction in typhoid death rate from an average of about 60 per 100,000 to about 1, or a saving per year of nearly 2,000 lives and 20,000 cases of this disease.

John R. Freeman Hydraulic Scholarship

The income from a fund of $25,000 has been made available for a travel scholarship in hydraulic engineering through the generosity of John R. Freeman, president of the Manufacturers Mutual Fire Insurance Co. and past president of both the American Society of Mechanical Engineers and the American Society of Civil Engineers. The scholarship is open to those who, by special endowment

and meritorious devotion, desire further to equip themselves by a year's study abroad, in institutions and hydraulic laboratories, and then give the benefit of that training to their profession and the advancement of knowledge. Two have been selected this year, to give special attention to the subject of flood prevention—Herbert N. Eaton, who has been associated with the Bureau of Standards for a number of years, and Prof. Blake R. Vanleer of the University of California. Mr. Eaton sailed on July 16 to join Mr. Freeman in Germany.

Sewage Plant Records*

What records should be kept by the plant manager and the use that can be made of them in operating the plant and in designing improvements or extension.

By John R. Downes†

The purpose of these notes is to make the plant records mean something more to the operator than mere collections of figures in neat columns and squares. These records may not only be very useful, but interesting as well, if their purpose is understood.

The purposes of such records are to show: (1) to what degree of efficiency the plant is being operated; (2) the effectiveness of the plant in accomplishing the purposes for which it was designed; (3) to form a defense against criticism; and (4) last but not least, to establish data upon which alterations, enlargements or a superseding plant may be designed.

In the rapidly developing area in which we of New Jersey are working, there is no such thing as standing still. Plants are being outgrown daily. If we have no adequate records, we are brought to a realization of this overgrowth by a notice from the State Board of Health to do something about the situation. Then we call in a designing or consulting engineer and tell him to design us a new plant. In the absence of accurate records he has only general information and rule of thumb methods upon which to base his new design and this is one of the causes of the large number of failures or partial failures in new plan design.

Another cause, in the past, has been that the consultant would not know what to do with the information if he had it. This is not criticism of the consultant but a statement of the general lack of information upon the subject of sewage disposal. Due to the excellent work of the New Jersey Sewage Experiment Station, fostered and reared through the efforts of this association, the consultant, from now on, can not get behind an alibi of general lack of information. The success of a plant will be squarely up to him and pure laziness will be his only excuse for failure, provided the operator of the old plant can produce an accurate record of operation over a period of years.

*Paper before the New Jersey Sewage Works Association.
†Supervising engineer, Plainfield Joint Sewage Works, Bound Brook, N. J.

CONNECTIONS AND FLOW

One of the most valuable records is that of the number and kinds of connections to the sewer system. Such a record should be demanded by State authorities for every sewer system, whether it boasts a disposal plant or not. This because the demand for a plant will inevitably develop in time.

The importance of data on number and kind of connections lies in the fact that, the world over, the per person contribution of organic waste is reasonably constant. Data from Russia and Germany purporting to indicate a variation in this per capita contribution due to starvation diet during the stress of war conditions, really confirm the general rule by showing how comparatively slight this variation is under such extremes of conditions.

Various industrial wastes of an organic nature are being investigated at numerous places and, by analysis and calculation, reduced to an equivalent per capita contribution. With such information at hand, the designer of the future will be able to determine accurately the prospective plant load from a study of the number and kind of sewer connections.

Of parallel importance is a record of the actual flow of liquid sewage. The number and kind of connections to the system will indicate the organic load on the plant, or the amount of energy which will be required to purify the sewage. The record of flow will indicate the size of pipes or flow channels necessary to carry the sewage at proper velocities; and also the dimensions of grit chambers, settling tanks and dosing siphons and oxidizing beds.

Flow records should show not only gross daily flow, but also hourly fluctuations, or at least daily maximum and minimum rates and the amount of variation due to extremes of dry weather or local flood conditions and the duration of high flow after flood.

These latter records the operator can make extremely interesting to himself by connecting up the variations in flow with the habits of the community. For instance, in one town it developed that the community bath night was Friday instead of the time-honored Saturday night.

Meters should be installed where practicable in all sewer outfalls for determining the flow. Where meters are not available weirs may be used. Dosing devices or filling devices may be made to serve for measurements where other means are not at hand. Finally, if none of these conveniences are at hand, float tests may be made between two manholes on a straight run of uniform size outfall line. In this case the depth of flow in the pipe line should also be recorded.

Though I do not for a moment wish to belittle the value of laboratory data, I should rather have a reliable record of flow and number and character of connections to work on in designing a new plant, than a complete record of analytical data, with the flow and connection records missing.

OXYGEN DEMAND

The simplest and, at the same time, one of the most valuable laboratory tests is the determination of putrescibility or the methylene blue test. This determination is so simple that there is no excuse for neglecting to make and record it very frequently.

The results of this test inform the State Board of Health inspector or your consultant of the length of time during which your plant effluent may be left undiluted without causing a nuisance; also of the quantity of stream water with which it must be diluted to prevent nuisance. A record of good tests of this kind is indispensable in defending action for damages for water pollution by persons farther down stream. You may make this test very interesting to yourself by also keeping a record of the appearance of growths on the outlet weir or at the edges of the outflowing stream of sewage. You will note that, when the methylene blue color lasts for several days the growths will be green, but that, as soon as you begin to lose your blue samples quickly, the growths along the edge of the sewage outfall will be white. This is because the chemical, "methylene blue," requires oxygen to give it its color and because oxygen is required for the growth of the green algæ. Try this and observe how many hours or days your blue test must give in order to produce a green growth at the outfall.

SUSPENDED SOLIDS

A somewhat more complicated test, yet one which anyone who can learn to weigh carefully can make, is the next in importance: the weight of suspended solids in the sewage at different stages of purification and in the sludge. With this is, of course, coupled the determination of volatile matter and ash in the solids. This latter is just a matter of burning off the volatile matter and reweighing the dish.

In case the weighing of solids is entirely beyond the capacity of your laboratory equipment, do not fail to make the very simple test for solids by volume. That is the so-called cone glass or Imhoff glass test.

There is considerable variation of opinion about even this simple test; as to the time allowed for settling before reading, whether one should jar or disturb the cones before reading to bring down the material collected along the sides, etc. But if you do it some one way, always the same, and keep a careful record of results, it will be comparatively easy for a future investigator to transpose your records into terms with which he is familiar by making a few representative tests by your method and his own.

STANDARD LABORATORY METHODS AND APPARATUS

May I suggest, however, at this point that this association should have a laboratory committee the duty of which it would be to recommend certain definite procedures in the determination of solids, both by weight and volume, so that all our data may be comparable. I know that certain other organizations have undertaken similar work but their deductions have not been altogether guided by the particular exigencies and limitations of the average sewage work's laboratory. This committee might well also establish a standard set of laboratory apparatus which would be at once simple, reasonable in cost, and effective.

The one other really valuable laboratory test to be made is that of pH. A practical and reliable method of making this test in sludges and sludge waters is still to be developed and may well be also referred to a laboratory committee.

There is, at present, little to be said in favor of the determinations of various forms of ammonia which has consumed so many laboratory hours in the past and the results of which fill many volumes. In the light of modern information it would seem better to confine routine analysis to the determinations outlined above and to spend the rest of our energy on intimate and practical problems which no operator needs to have pointed out to him. They stare him in the face constantly.

DATA ILLUSTRATING VALUE OF RECORD

I shall now illustrate what may be learned from a set of records by means of some actual data from The Plainfields and Dunellen Joint Works.

This plant was designed as of 1916 with the idea that it would carry on to 1931, when the probable population would be 40,000. This estimate was based on records of growth from these and other comparable communities, and the figures appeared to be as satisfactory as we could expect. However, a shift of population to the suburban metropolitan district, of which these communities are a part, upset all calculations and we reached the projected population in 1923 instead of 1931.

A careful record of number of connections was available and has been repeatedly checked against other available population estimates.

The flow of sewage as estimated in the basis of design of the plant was 100 gallons per capita. This, too, seemed reliable as this rate had been maintained over a period of a number of years. However, a water supply fight and alleged shortage of water resulted in the installation of meters in this district, and, as the population increased, the per capita consumption of water (or contribution to the sewer systems) decreased from 100 gallons to 80 gallons.

Without available records it would indeed have been a mystery how the population could have increased from 34,000 in 1919 to 47,000 in 1926, without any increase in flow of sewage and why, with no increase in flow, the plant could not do as good work in 1926 as in 1919. Plainly it would have been charged up to the operator.

But the records available did not stop there. Years of records on this sewage previous to the building of the present plant showed about 150 parts per million of suspended solids in the raw sewage. This ratio of 150 p.p.m. held up to 1922 when the divergence between connected population and the sewage flow began to show.

The following is the record of population, flow, and p.p.m. suspended solids from 1920 to 1926 incl. Population is based on 5 persons per connection and checked by other information. (See page 344.)

Take the year 1921 with a flow of 3.2 m.g.d., 150 p.p.m. of suspended solids in the sewage entering and 59 p.p.m. in the tank effluent. This is a difference of 91 parts per million which represents the solids retained in the settling tanks. The flow was 3.2 million gallons weighing 8.34 pounds per gallon or 26.7 million pounds. From each million pounds of sewage there was retained 91 pounds of dry solids, or a total of 26.7 x 91 equals 2,429 pounds of dry solids.

Now, take the year 1926 with the same flow of

Year	No Connections	Population	Flow m.g.d.	Solids p.p.m.
1920	6,909	34,500	3.7*	161
1921	7,138	35,700	3.2	150
1922	7,368	36,800	3.3	147
1923	7,707	38,500	3.3	188
1924	8,093	40,500	3.3	212
1925	8,464	42,300	3.2	216
1926	9,110	45,550	3.2	218

*1920 flow high due to abnormal flow first six months. Industrial sewage of negligible character.

3.2 m.g.d., 218 p.p.m. solids in the sewage and 92 in the effluent. The difference is the quantity retained, equal to 126 p.p.m. By the above calculation 26.7 x 120 equals 3,364 pounds dry solids. This is almost exactly 33 per cent more material to handle, though the flow was the same.

The solids, as you will have to handle them, will not be dry but will constitute about 5% of the weight of sludge which you will have to handle; the balance being water. Then the solids retained in 1921 represent 48,580 pounds while those in 1926 represent 64,080 pounds of green sludge daily.

48,500 = 770 cu. ft.
64,080 = 1,017 cu. ft.

In order that you may see a direct relation between your own problems and the parts per million of suspended solids, I will show the calculated quantity of sludge derived from 1,000,000 gallons of sewage in a case where an even 100 parts per million of solids are retained by your settling tank. You will know whether you are getting a half million, a third of a million or two million gallons, etc., and from your own records or from analyses returned by the State Health Dept., you will know whether you are retaining half a hundred parts, three-quarters of a hundred parts, etc., and may readily determine the quantity of green solids to be handled. It will be very interesting to check this up by measuring the sludge in the tanks and on the beds, etc.

One million gallons of sewage leaving 100 parts per million of solids in the settling tanks will yield in dry solids 8.34 x 100 or 834 pounds, and in the wet solids, (95% moisture), twenty times this or 16,680 pounds equal to 266 cu. ft. or 1,995 gals., say, in round numbers, 2,000 gallons.

From such a calculation you will be able to determine the size of pump needed to move the solids from the settling tank. Or, if you are having trouble wtih getting your sludge digested, you may apply Dr. Rudolfs' 2 per cent. rule or the writer's deposition and accumulation curve, "Public Works," November, 1923, or Transactions of the American Society of Civil Engineers, page 921 of the August, 1924, issue. (In the latter the word "Deposition" was copied as "disposition" and "days" was substituted for "Deposition units" in preparing the chart for print, so that the chart as there lettered is rather meaningless without these corrections.) You will, more than likely, find that you have not sufficient sludge digestion capacity. If your deficiency is not too great, you may turn to the Experiment Station data and with a knowledge of the quantity of suspended solids and the percentage of these which is volatile (organic), you may determine the proper quantity of lime to be added to tide you over the difficulty.

Garbage Collection in Norfolk

Under this title we published, in our July issue, a paper that was read before the International Association of Street Sanitation Officials by Walter H. Taylor, director of public works of Norfolk, Va. In a letter to this journal, Paul Patton, who holds a ten-year contract for the collection and disposal of garbage in Kansas City, Mo., questioned the figures given by Mr. Taylor. He says: "On a basis of 1200 pounds as the weight of a cubic yard of garbage, the collection in Norfolk amounts to 94 pounds per capita per year, and the cost is $2.48 for collection and disposal. This figure is made up of $1.81 for collection and 67 cents for disposal. I have made very careful statistical studies in a large number of cities and have analyzed these figures after obtaining them myself from the original sources, and have developed a per capita cost that is several times the cost in the article referred to."

We referred this comment to Mr. Taylor, and he has furnished us with more detailed figures from the 1926 annual report, prepared by W. G. Mitchell, superintendent of street cleaning. These figures, with Mr. Mitchell's explanations, are given below. It will be seen that, with an average of 5 trucks, 6½ tractors, 30 trailers, 32½ carts, 10 wagons and 77 horses (86 in the stable) in service during the year, together with sweepers, flushers and sprinklers, the cost figures include nothing for depreciation, interest, etc., except as the $18,019 spent for new equipment, tools, brooms and horses may represent a substitute for such items. Also, apparently nothing is charged for stables, land and buildings used for storing equipment. In other words, the costs given are based on operating expenditures only; while the figures used by Mr. Patton probably include interest, depreciation, insurance, taxes and other items which must be included by a contractor in figuring the cost to him of performing such work. The wages, also—$2.80 a day for laborers, $5.60 for carpenters, etc.—are about half those reported as paid in St. Louis and less than half the prevailing wages in New York. As wages constitute about three-fourths the expenditures, this difference would go far toward reconciling the cost calculations of Mr. Mitchell and Mr. Patton.

Mr. Mitchell's report is as follows:

Our total expenditure, according to annual report, was $291,233.23 for the year 1926. This includes purchases of equipment, repairs and supplies for same, repairs to buildings, purchase of feed for 87 horses. We employed an average of 177 men and furloughs were paid to 147 men (10 days each).

Industrial compensation amounting to $1,052.57, and pensions amounting to $3,000.00 were also paid.

We show below our work for entire year, which includes the first 6 months, to which the figures given by Mr. Taylor referred.

Collections and Disposals

$36,386.90	35,597 cu. yds. garbage collected, 24,852 yds. incinerated	
26,863.82	62,583 cu. yds. paper collected, 62,404 yds. incinerated	
90,002.11	139,516 cu. yds. trash, ash, mis. coll., 1,071 yds. trash incinerated	
29,519.54	1,424 cu. yds. sweepings collected behind motor sweeper	
	3,828 cu. yds. sweepings collected behind motor flusher	
	4,950 cu. yds. sweepings collected behind horse drawn sweeper	
	27,074 cu. yds. sweepings collected behind hand sweepers	
$182,772.37	274,972 cu. yds.	
	3,647 dead animals incinerated.	

Sweeping of Streets

$55,556.88	185,319,696	sq. yds. Hand sweepers, smooth paved streets swept
3,288.69	37,999,848	sq. yds. Motor Sweeper, smooth paved streets swept
9,086.64	57,883,372	sq. yds. Flusher, smooth paved streets flushed
493.94	3,976,185	sq. yds. Sprinkler, unpaved streets sprinkled
15,638.67	33,876,244	sq. yds. Belgian blocks, swept
9,669.75	15,222,289	sq. yds. unpaved streets swept, hand sweepers
$93,734.57	334,277,634	

Summary of our work shows:

$4,530.00	Salaries paid
213,532.69	per diem men (includes 177 men daily av).
31,061.36	supplies
17,850 78	repairs
4,052.57	fixed charges (pension and workm. comp.)
2,186.95	general operating
18,018.88	new equipment, tools, brooms, etc.
$291,233.23	

Cost of Collections

Area	Material	Total	Per. cu. yd.
139, 516 cu. yds.	trash and misc.	$90,002.11	.6451
35,597 cu. yds.	garbage	36,386.90	1.022
62,583 cu. yds.	paper	26,863.82	.4292
37,276 cu. yds.	sweepings	29,519.54	.7919
274,972		$182,772.37	

Cost of Incineration

Garbage	24,852 cu. yds.	$11,385.24	.4581
Paper and Trash....	15,475 cu. yds	3,341.05	.2159
*Paper	48,000 cu. yds.		
		$14,726.29	

*This paper is used as fuel in the incineration of garbage.

Distribution of Street Sweeping

	Sq. Yds.		
Horsedrawn sweeping	33,876,244	$15,638.67	.000461
Motor sweeping	37,999,848	3,288.69	.000086
Hand sweeping	185,319,696	55,556.88	.00029
Lanes and unpaved streets	15,222,289	9,669.75	.00063
Flushing paved streets....	57,883,372	9,086.64	.000156
Sprinkling unpaved streets	3,976,185	493.94	.000124
	334,277,634	$93,734.57	.0002

Total of above expenditures $291,233.23

You will note this work carries 4 items—garbage; trash, ash and miscellaneous; paper; sweepings.

The entire amount of money expended has been placed under its proper heading divided in four parts We could not easily go very far astray in checking these expenditures.

We use in our daily operations the following averages:

Garbage:

Men, 34; trucks, 1¾; tractors, 2; trailers, 15; carts, 3¼; wagons, —; teams, 15; average miles haul to dump, 2½.

Trash:

Men, 49; trucks 1⅜; tractors, 3½; trailers, 13; carts, 10⅞; wagons, 7; teams, 25; average miles haul to dump, 1½.

Paper:

Men, 23; trucks, 1⅞; tractors, 1; trailers, 2; carts, 1; wagons, 3; teams, 7; average miles haul to dump, 2½.

Sweeping:

Men, 66; trucks, —; tractors, —; trailers, —; carts, 17⅜; wagons, —; teams, 30; average miles haul to dump, 1½.

We use on an average of seven men at the incinerators.

Our team and equipment is owned by the city and cost of feed is pro-rated four ways. Whenever horses are purchased, as with equipment each year, the amount of purchase is pro-rated four ways. All of this is shown in our expenditures under proper heading. The horse feed ($17,460.76) is included in above figures (86 horses in stable).

Mr. Patton's statement of weights agree with ours as to—

Garbage	1200 lb. to yard

and other averages are—

Trash	1000 lbs. to yard
Paper	111 lbs. to yard
Sweepings	1000 lbs. to yard

We have weighed vehicles each day and then checked with loads and the variation is very small.

We have been seriously handicapped by the retaining of old men in the employ of the city. Many of our men, especially sweepers, are old and unable to do a full day's work. If Mr. Patton had to contend with same in his municipal contracting he would have cause to worry.

I cannot state what could be done under local conditions in Kansas City, as labor and method of handling differ; but with up-to-date equipment, able-bodied men, and a fair wage for laborers, unless his haul is long and disposal expensive, his figures could surely be less under careful supervision. Our scale of wages per 8-hour day compares favorably with wages in this section:

For laborers, $2.80 1st year to $3.60 4th year; for truck drivers, $4:00; for foremen, $4.80, $5.00, $6.00, $6.50; for carpenters, $5.60; for blacksmith, $5.60; for horseshoer, $6.00.

Refuse Collection in San Francisco

Most if not all of the largest cities, with the exception of San Francisco, collect their garbage in municipally owned wagons or trucks, and generally by municipal employees. San Francisco, however, since 1921 has given the privilege of collection to two scavengers' cooperative organizations, which divided the city between them; the Board of Health having power to control routes, investigate and remedy complaints, compel scavengers to maintain sanitary conditions, and prevent overcharging.

A few months ago the City Garbage Removal Company, after having endeavored unsuccessfully to obtain from the Board of Health permission to collect refuse in certain districts of the city, obtained the signatures of voters necessary to requiring a ballot on an initiative measure, proposing certain amendments to the existing ordinance, which measure was adopted by the voters on June 14, although opposed by the Bureau of Governmental Research.

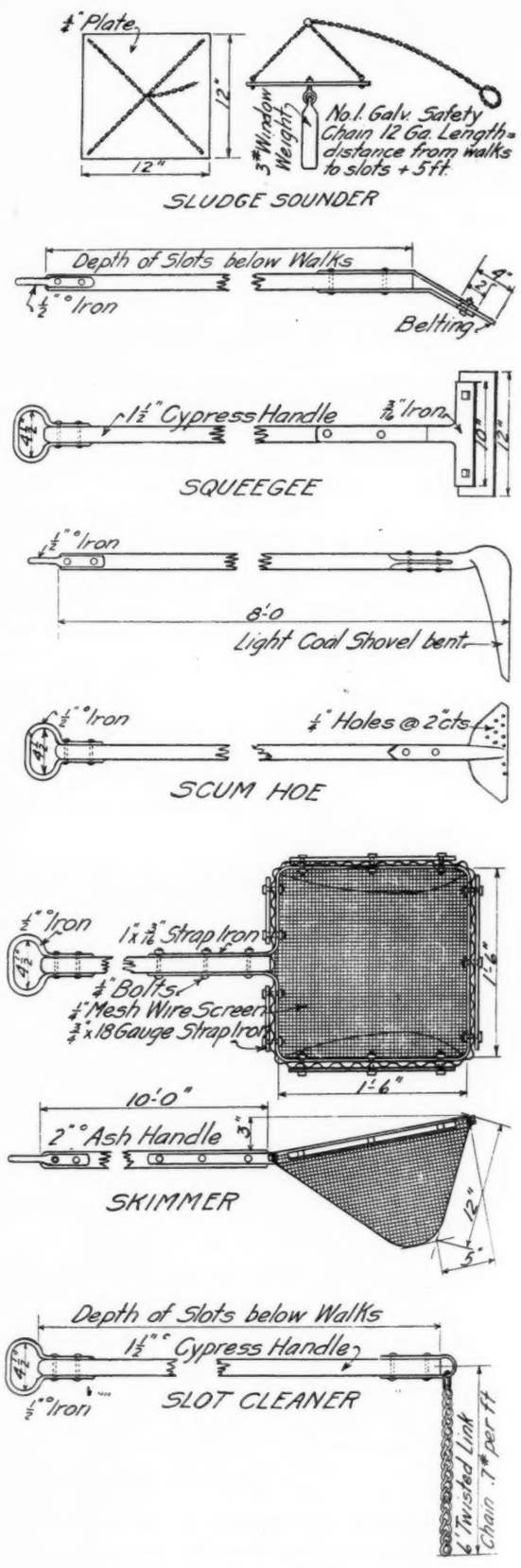
The principal amendments adopted provide that the Board of Health no longer have the power to grant or deny applications to collect refuse on certain routes, but permits to scavengers to operate on routes designated on a map, which divides the city into 97 zones, must be granted whenever an applicant has secured signatures of 20% of the patrons on any route stating that they are receiving inadequate service from the present scavenger. More than one applicant may secure a permit to collect on the same route. The Board is apparently deprived of any control over the design of vehicles operated by scavengers.

Commenting on this, the Bureau of Governmental Research states that prior to 1921, when two or more scavengers could collect on the same route, there was competition among them for the most lucrative routes, while they neglected the least lucrative districts. Moreover, two or more scavengers collected on the same street or even in the same building, making it impossible to place responsibility for insanitary conditions resulting. On the other hand, it is claimed that under the new amendments, regulatory provisions can be better enforced and more efficient service given the householder by providing competition; that competition will prevent overcharging and do away with the so-called "high-handed methods of the garbage trust."

The Research Bureau believes that this law will not improve conditions but more probably bring about a return of the intolerable conditions which existed prior to 1921; that the probable rate reductions will be only a slight palliative for the ills of the present system and could have been determined more equitably after proper investigation of service and cost. The omission of the clause giving the Board of Health regulatory power over the conditions of refuse collection vehicles may prove to be a menace to the public health.

Tools for Imhoff Tank Operators

The operation of Imhoff tanks requires a few simple tools—so few and so simple that some operators get along with such makeshifts as a long stick and a shovel. Most of them add some kind of a squeegee and a few have evolved more or less effective and ingenious contrivances. The accompanying illustration, which is self-explanatory, from a pamphlet, "Imhoff Tanks and Separate Sludge Digestion," distributed by the Pacific Flush Tank Co., shows several tools which have proved effective. We do not know of any firm that furnishes these, but they are easily constructed of readily obtainable materials and can be made by the operator himself or by a local blacksmith at little cost.



TOOLS FOR IMHOFF TANK OPERATORS

Water Purification in Great Britain

Abstract of report by H. W. Streeter, of the U. S. Public Health Service, based upon visits to a number of English cities last summer. Purification becoming increasingly necessary.

The most important sources of supply for public water in Great Britain are the rivers and streams and the upland gathering ponds, but the ultimate capacity of impounded water supply from sparsely inhabited upland sources has practically been reached and future additions to the present sources of supply must be obtained from natural streams, which will make necessary more general purification than in the past.

Naturally storage and sedimentation are important features of British water purification. In most of the larger cities the aim is to have a minimum of ten days' retention capacity available in storage reservoirs. Also filtration of water through sand, and in some instances chlorination, are well established both as supplementary and as independent measures of purification.

In London, Liverpool, Birmingham and Sheffield the total capacities actually provided are equivalent to nominal storage periods ranging from about 50 to over 100 days. However, only a portion of the total storage capacity is available for draft. In spite of the considerable area of these reservoirs they appear to be comparatively free from growth of algae and other water plants.

While careful observation has established conclusively the effectiveness of natural storage as a measure of sanitary protection for water supply, the capital expense appears to be decidedly greater than that of artificial filtration. At Liverpool, for example, the total capital cost of developing the two collection and storage systems, including the pipe lines, was about $23,000,000 up to the end of 1921. As the combined average output of the two systems is roughly 60,000,000 gallons daily, the cost per million gallons per output capacity is about $388,000, which is between five and ten times the unit cost of a modern water filtration plant; while cost of maintenanance of such systems per million gallons of output appears to range from slightly less to considerably more than the average cost of operating filtration plants. The value of the storage furnished, however, must of course be considered in connection with this.

FILTRATION

Because of the freedom of English surface waters from excessive turbidity and because of the decided sentiment in that country against the use of aluminum or other chemical coagulant, rapid-sand filtration is used in few places except as preliminary treatment to slow-sand filtration. In some instances, these preliminary or "roughing" filters are installed to relieve the slow-sand filters of an excessive burden of turbidity or bacteria, or for removing crenothrix, algae and other microscopic growths, prior to slow-sand filtration.

Slow sand filtration, however, is the standard for general use. Where water to be filtered is taken directly from rivers, it is usually subjected to storage, chlorination or preliminary rapid-sand filtration. About 83 per cent of London's water supply is taken from three rivers and a portion of this is passed through storage reservoirs and another is given chlorine treatment, before being filtered through slow-sand filters. At one works however, a rapid-sand filtration plant has been installed for preliminary treatment which is similar in its general features to plants in the United States but is operated without the use of a coagulant, being intended primarily for removing microscopic organisms to prevent clogging the slow-sand filters.

In a very considerable number of instances, slow-sand filtration is applied as an added factor of safety to water from upland sources which has previously undergone more or less prolonged storage in impounding reservoirs. At Birmingham slow-sand filtration is preceded by a roughing filter, principally for removing crenothrix and other iron-forming organisms. There are 30 of these rapid filters occupying an area of 2¾ acres and operated at a rate of about 10,000,000 gallons per acre per day, while the slow sand filters are operated at a rate of about 3,000,000 gallons per acre per day. The roughing filters, which are located near the gathering ground in Wales, are cleaned by means of a special overhead sand washing device, while the slow-sand filters, located near the city, are cleaned by the usual method of removing the top layer of dirty sand and washing it in hydraulic ejectors.

In general, British filtration plants are found to lack many of the mechanical control devices and other conveniences found in American plants, but the lack of them is not seriously felt owing to the greater availability and lower cost of skilled manual labor. It might seem that there was a serious deficiency in British water filtration practice in the absence of a sufficiently detailed and standardized system of laboratory control over plant operation. However, the quality of raw water in that country is better than that in this and preliminary storage probably insures a more uniform quality, for which reason it may well be that the laboratory control which is customary and considered necessary in this country would not be justified in the majority of British filtration plants.

CHLORINATION

As British sources of water supply are not subject to great pollution and there is general use of long-time storage, chlorination is not general in that country. In some instances, notably in the London water systems, chlorination has become an established procedure, but here, as elsewhere in England, the tendency has been to chlorinate water prior to rather than after filtration. At London considerable success has been realized in treating raw water with excessive amounts of chlorine, followed by dechlorination with sulphur dioxide. This treatment not only has relieved the filtration systems of over burden, but in some cases has eliminated or at least

minimized the tastes imparted to waters containing phenols when treated with small amounts of chlorine.

The average per capita consumption of water in England at present is slightly less than 30 gallons daily, but the extension and improvement of plumbing facilities in the homes, and possibly other factors, are likely to cause an increase in the unit consumption. This, together with the natural growth in population, will probably necessitate considerable increases in the amount of water furnished and this in turn will apparently force the British cities in the not distant future to turn to sources of water supply such as rivers which are more polluted than the waters now used; which will probably necessitate intensive development of water purification measures.

Specifications for Centrifugally-Cast Iron Pipe

Prepared by Pipe Committee of Federal Specifications Board for use by the several Federal Departments.

Specifications for cast iron pipe made by centrifugal processes have been prepared by the Pipe Committee of the Federal Specifications Board which, when adopted, will be the official purchase standard for all activities of the United States Government. By permission of the chief coordinator of the Bureau of the Budget, these specifications are published in the August Journal of the American Water Works Association, with an explanatory statement by H. A. Stacy, associate engineer, Bureau of Yards and Docks, Navy Dept., and I. J. Fairchild, chairman of the Technical Committee on Pipe of the Federal Specifications Board. The specifications and the main points of the statement are given below.

The specifications were prepared because of "(1) the greater strength of centrifugal pipe compared with vertical sand cast pipe, (2) greater homogeneity, (3) smoother interior, (4) lighter weight, and (5) lower cost when laid. Furthermore, conditions in the industry indicate that centrifugally cast pipe may possibly supplant other pipe in the small sizes due to a faster rate of production with fewer men, (one DeLavaud machine with 5 men will produce 30 to 40 length of 6-inch pipe per hour) and better working conditions which reduce the uncertainty of the skilled labor problem.

"In the United States, mass production of centrifugal pipe is confined to two general methods, (1) the De Lavaud process (used by the United States Cast Iron Pipe and Foundry Company at their Burlington, N. J., and Birmingham, Ala., plants, and by the National Cast Iron Pipe Company, which employs a revolving, water-cooled, metal mold), and (2) the "Mono-cast" or "Sand Spun" method (used by the American Cast Iron Pipe and Foundry Company and R. D. Wood and Company), in which the revolving metal flask is lined with skin-dried green sand. No cores are required in either process except for the bells."

After studying the several formulas for calculating pipe thickness, the committee adopted a modification of the Brackett formula, $t = \frac{d(P+P')}{10{,}000} + \frac{0.3}{d^{0.3}}$ in which P is working pressure and P′ allowance for water hammer, t is thickness in inches and d is nominal interior diameter in inches; the 10,000 being one-half the assumed safe ultimate stress, and a factor of safety of 4 being provided, instead of 5 (usual for regular pipe) because of superior homogeneity and general structure. The second term allows for eccentricity, handling, corrosion, etc.

It is proposed to make the outside diameters identical with Class A of the American Water Works Association for all classes in diameters to and including 12 inches, which will therefore intermember with Class A, B, C or D. To provide sufficient thickness of metal for satisfactory tapping, the thicknesses have been increased slightly over those computed by the formula for 4-in. pipe in both classes and for 6-in. in the 150 lb. class.

The test bar cast separately has been omitted, since in centrifugally cast pipe it is necessary to cut strips from the pipe itself for tests for hardness, moduli of elasticity and rupture, and chemical analyses.

Omitting the general clauses of Federal specifications, the specifications, dated July 15, 1927, are as follows:

Standard Dimensions and Weights

Nominal Inside Diameter, Inches	Actual Outside Diameter, Inches	Dimensions of Bells Inside		Class I—150 Pounds Pressure, 346 Feet Head				Class II—250 Pounds Pressure 576 Feet Head			
					Weight, pounds				Weight, pounds		
		Diameter, inches	Depth, inches	Thickness, inches	12 feet long	16 feet long	16 feet 4.85 inches long	Thickness, inches	12 feet long	16 feet long	16 feet 4.85 inches long
4	4.80	5.60	3.50	0.34	201	260	269	0.37	215	280	289
6	6.90	7.70	3.50	0.36	312	402	412	0.40	340	442	453
8	9.05	9.85	4.00	0.38	437	566	580	0.46	514	669	685
10	11.10	11.90	4.00	0.42	586	763	780	0.52	706	922	944
12	13.20	14.00	4.00	0.46	763	993	1,017	0.58	935	1,222	1,252

II. TYPE, SIZES, CLASSES

1. Pipe shall be furnished in bell and spigot type, with or without bead unless otherwise specified, with lead groove in bell, and in the following classes:

Class I. 150 pound pressure
Class II. 250 pound pressure

2. This specification covers sizes 4 to 12 inches inclusive.
3. Pipe shall be furnished coated, unless cement lined or uncoated pipe is required in the purchase order.

III. MATERIAL AND WORKMANSHIP

All pipe shall be made of cast iron of good quality, and of such character as shall make the pipe strong, tough and of even grain, and soft enough to satisfactorily admit of drilling and cutting. Each pipe shall be smooth, free from cold shuts, scale, lumps, blisters, sand holes and defects of every nature which unfit it for the use intended. It shall be straight, and shall be true circles in section with its inner and outer surfaces concentric. No plugging, filling, or burning in will be allowed.

IV. GENERAL REQUIREMENTS

1. Casting. All pipe shall be cast centrifugally in machines. A record of the melting and pouring temperatures

of the iron shall be furnished the inspector, when requested.

2. Chemical analysis shall be made by the manufacturer from each heat to determine graphitic and combined carbon or total carbon, if the separate determinations are not available, manganese, phosphorus, sulphur and silicon, and duplicate copies of test reports shall be furnished the inspector. Sulphur shall not exceed 0.10 per cent and phosphorus 0.90 per cent in either ladle or inspection analysis.

3. Annealing. Pipe cast in metal contact molds, after withdrawing from machines, shall be annealed to meet the hardness limits designated under "Inspection and Tests." Pipe cast in sand lined molds, and stripped while showing color of heat, shall be placed in an oven, and shall not be removed therefrom until cooled to 500° F. or under.

4. Lengths. Pipe shall have a laying length of 12 feet, 16 feet or 16 feet 4.85 inches (5 meters). Not more than 10 per cent of cut pipe shall be accepted. Such cut pipe shall be no more than one foot under nominal laying length. Bidder shall state which length he proposes to furnish.

5. Tolerances in diameter. The inside diameters of the bells and the outside diameters of the spigot ends of pipe, exclusive of bead, shall not vary plus or minus from the tabulated dimensions by more than 0.06 inch for pipe 12 inches and less in nominal diameter.

6. Tolerances in thickness. The tolerances in thickness, plus or minus, shall not exceed those listed below.

Nominal Diameter *Inches*	Tolerance, Plus or Minus *Inches*
4	0.04
6	0.045
8	0.05
10	0.055
12	0.06

For all sizes of pipe, tolerances not exceeding 0.02 inch additional to above will be allowed for spaces not exceeding 8 inches in length in any direction.

7. Tolerance in weight. The weight of no single pipe shall be less than the nominal weight by more than 5 per cent.

8. Cleaning. All pipe shall be thoroughly cleaned, and any rough spots in bells or on spigot ends shall be ground, before coating or lining.

9. Physical requirements. Pipe shall conform to physical requirements as given in Section VI-5, 6 and 7.

10. Coating. Unless otherwise specified all pipe shall be completely coated inside and out with coal-tar pitch varnish, to which sufficient oil shall be added to make a smooth coating, tough and tenacious when cold, not "tacky" and not brittle.

11. Cement mortar lining. (*a*) When required in the contract or purchase order, pipe shall be lined with cement mortar. No coating will be applied to the outside unless specifically provided in the contract or order. Cement shall be standard Portland, complying in all respects with the requirements of United States Government Master Specification No. 1 for Portland Cement in effect on date of invitation for bids. Sand shall be clean, free from organic matter, loam, and other foreign material. It shall be screened through a screen with not less than 12 meshes per inch.

(*b*) Unless otherwise specified mortar shall be approximately three parts of cement to one part of sand by volume, and thoroughly mixed in a power mixer, using only sufficient water to permit of proper distribution of mixture in pipes. Mortar shall be promptly used after mixing and no mortar shall be used which has attained its initial set.

(*c*) Cement mortar lining shall be smooth, continuous, completely adherent and reasonably free from check cracking. All excess mortar shall be removed from the bottom of the bell. No pipe shall be shipped until lining is thoroughly hard.

(*d*) Thickness of linings shall be 1/8 inch ± 1/16 inch for all sizes to and including 12 inch.

12. Weighing. Each length of pipe shall be weighed and the weight plainly marked on the pipe. Coated pipe shall be weighed after coating. Cement lined pipe shall be weighed before lining and the mark shall be placed on the outside surface.

13. Handling. Care shall be taken in handling the pipes not to injure the coating, and no pipes or other material shall be placed in the pipes during transportation, or at any time after they have been coated.

14. In addition to the weight being painted on the pipe as previously specified, each pipe shall have distinctly cast or stamped into the metal on the face or outside surface of the bell the manufacturer's mark, and the year in which the pipe was cast. When so specified in the invitation for bids each pipe shall also have cast upon it or stamped into the metal a designated symbol.

V. DETAIL REQUIREMENTS

The pipe shall accurately conform to the dimensions given in the table. (See page 348.)

VI. INSPECTION AND TESTS

1. The contractor shall furnish the inspector, free of cost, such facilities as may be necessary for the performance of his work.

2. The inspector shall have free access at all times to all parts of any manufacturing plant which concern the manufacture of the material ordered.

3. All handling of material, sampling, preparation of test specimens, and testing thereof, except purchaser's chemical analysis, shall be performed or furnished by the contractor without expense to the Government. Where the manufacturer has no facilities for making tests or analyses required, they will be made at some suitable place in the vicinity, at the contractor's expense, and in the presence of the inspector.

4. All pipe shall be subjected to a careful surface inspection, and hammer and rolling tests. All bells shall be tested by circular gages and no pipe will be accepted which is deficient in joint room.

5. Tests of material. From each 300 lengths of pipe, or fraction thereof, of each size in the contract or order, one length of pipe shall be selected by the inspector before coating. From each sample pipe there shall be cut and machined one test strip 12 inches long, 0.50 inch deep, and the full thickness of the shell in width. This shall be tested as a beam (with machined surfaces top and bottom) on supports 10 inches apart with load applied at two points 3 1/3 inches from the supports. The strip shall be accurately calipered at point of rupture and stress calculated by the formula

$$S = \frac{Plc}{6I}$$

The secant modulus of elasticity at the breaking load, shall be calculated by the formula

$$E = \frac{23Pl^3}{1296Iy}$$

In these formulas S = modulus of rupture
E = modulus of elasticity
P = total load
l = length of span
c = distance to extreme fibre
I = moment of inertia
y = center deflection at load P

The secant modulus of elasticity shall not exceed 15,000,000 pounds per square inch with a corresponding modulus of rupture not less than 40,000 pounds per square inch or as an alternate, the secant modulus of elasticity shall not exceed 10,000,000 pounds per square inch with a corresponding modulus of rupture not less than 35,000 pounds per square inch.

6. Hydrostatic tests. Each length of pipe shall be subjected to a proof of 500 pounds hydrostatic pressure, and while under pressure shall be subjected to a hammer test. A pressure gage shall be used to show the pressure applied, and the pipe shall be under test pressure at least one-half minute. Any pipes showing defects by leaking, sweating, or otherwise, shall be rejected.

7. Rockwell tests. Upon the machined edges of each test strip there shall be made at well distributed points not less than 3 determinations, using a 1.59 mm. (1/16 inch) ball and 100 kgm. load. The average Rockwell No. shall not exceed 95. An additional determination shall also be made for pipe cast in metal contact machines, upon the outside of each pipe, using a portable type machine. The equivalent Rockwell No. for the exterior shall not exceed 95.

8. Chemical analyses. In addition to such analyses as are required to be made by the contractor, the inspector may obtain samples for chemical analysis from finished material representing each melt. The inspector may have samples for chemical analysis taken from test strips, or from any part or parts of the material concerned, provided the serviceability of the part or parts is not destroyed. The sam-

ple taken for chemical analysis shall be of sufficient size to permit five analyses to be made.

9. Rehearing. In case of dissatisfaction with results of the chemical analysis, the contractor may make claim for a rehearing, in which case the chemical composition shall be determined by a Government laboratory. Part of any sample taken for chemical analysis shall be furnished the contractor if he so requests the inspector at the time the sample is taken.

10. Retests. If any test specimen shows defective machining or obvious lack of continuity of metal it may be discarded and replaced by another specimen selected by the inspector. If any of the test specimens selected fails to meet the requirements specified and the purchaser permits a retest, at least two additional replacement specimens shall be selected by the inspector, both of which shall meet requirements.

VII. MARKING OF SHIPMENTS

Marking of shipments shall be in accordance with best commercial practice unless otherwise specified.

Bids should be based on the linear feet and none accepted on a tonnage basis.

For lines for water known to cause serious tuberculation it is recommended that pipe be not coated, but be lined with cement mortar.

Methods of Distributing Concrete*

Segregation to be avoided in all stages of transportation from mixer to form. Hoisting, chuting, conveying in carryalls, industrial cars, derricks, motor trucks, belt conveyors, and pneumatically

By Nelson L. Doe†

HOISTING

Buckets for hoisting concrete are of three general types: (1) the large-top, rather shallow, cylindrical-bottom type; (2) the deep, squarer, rolling-discharge type; and (3) the pyramid bottom-discharge type bucket, as now usually specified for use with steel masts. The deeper bucket offers less opportunity for the spreading out of the concrete, as its cross-section is not so large for given capacities. It also possesses an advantage in dumping, as the pouring action is greater than with the shallow bucket. The load is of much greater thickness when discharged from the deeper bucket than when it slides out of the shallow one, and it is discharged quicker. Neither bucket should be dumped into a hopper that has a large bottom. The concrete should be poured into itself so that the surface of the mass rises uniformly around the entering stream.

A bucket which discharges through a gate at the bottom causes much less segregation of aggregates than the buckets which unload by dumping the concrete over the edge. This is a decided point in favor of the pyramidal type of bucket. A batch of concrete of ordinary consistency improperly chuted from the mixer into a bucket of this type with noticeable segregation will be discharged through the gate in the bottom partially remixed.

Hoppers so designed that a swirling action or eddying of the mass is noticeable should be corrected, for whenever this takes place the aggregates tend to separate. Gates should shut tight and quickly, otherwise rich material wastes away, leaving coarse aggregates against the gate.

Although the actual hoisting of concrete in buckets has little effect on quality, improper loading or unloading of the buckets will cause segregation, and these features should be carefully arranged. The less concrete is handled the less segregation and the more uniformity in the deposited concrete. The moving of concrete a few feet in an improper manner may affect its quality more than properly conveying it long distances.

CHUTING

With modern ideas of water control and consistency, most of the objections to chuting concrete from the standpoint of quality have been automatically removed. Concrete of proper consistency can readily be chuted. Concrete of a very wet consistency cannot be chuted without marked deterioration. These facts are a strong argument in favor of chuting concrete, for chuting furnishes a check on the consistency of the concrete. With given materials, the limiting angles of distributing chutes can readily be ascertained after the action of a few batches has been studied, and once the chutes are erected accordingly, little segregation is experienced.

Different aggregates and chutes produce different effects on the velocity of the concrete carried, so these limiting angles vary considerably. Gravel concrete will be best handled at a slope of approximately one vertical to three horizontal, while concrete of the same consistency made with broken stone or slag may require a slope of nearly one to two.

Details of chutes have much to do with the flow of concrete and improvements in chute designs have steadily been made. The increased size of end connections and their improved shapes have done much to eliminate overflowing and clogging. This permits a considerably stiffer concrete to be carried safely. More harmful effects may result in chute distribution due to improper discharge at one point along the line than in the entire line of chutes properly adjusted. A proper receiving hopper should be provided at the end of the chutes; or if the concrete is placed directly in the forms, it must not fall freely more than a few feet, or be shot out at an angle. Long runs of chute should always discharge into a hopper having a bottom gate.

CONVEYING WITH TWO-WHEELED CARRYALLS

From a practical point of view there is little to criticize regarding this method, although study shows that concrete transported by carryalls segregates en route. Due to the different specific gravities of the materials and the vibration of wheeling, all heavy aggregates tend to settle while the fine material and excess water rises to the top of the carryall. In batches of wet consistency, segregation is more pronounced than in batches of ordinary consistency.

Tests indicate that concrete placed in the forms by wheeling in carryalls will be segregated to such an extent that variations from the mean strength of 20 per cent will not be unusual. The redeeming feature of this, however, is the fact that each carryall contains less than 6 cu. ft. of concrete, hence no

*Paper before American Society for Testing Materials.
†Of the Turner Construction Co., New York City.

great volume is affected. As each carryall is placed in the forms the opportunities for remixing are present, so that while segregation during transit may help to explain non-uniformity of field tests, the strength of the concrete over any considerable area is probably quite uniform.

Concrete discharged directly from the mixer to carryalls eliminates all hazards of segregation due to chuting or hoisting, but it is not easy to fill carryalls properly from the mixer chute. The concrete leaves the mixer too rapidly, and strikes the carryall at too flat an angle, causing it to swirl and load the carryall unevenly. There is a tendency to load carryalls when they come to the mixer regardless of whether the batch has been mixed sufficiently, which is very detrimental to quality.

DISTRIBUTION BY INDUSTRIAL CARS OR DERRICKS

For mass work, the dumping of concrete directly from the mixer into derrick-handled buckets is most satisfactory. Buckets can be set so that the mixer discharge strikes the center of the bucket practically vertically. There is little vibration as the bucket is hoisted or lowered to the position where the concrete is to be deposited.

Concrete discharged directly from the mixer to industrial cars shows no unusual segregation of aggregate, provided the discharged concrete drops vertically into the body. There is always less segregation in cars having deep bodies than shallow ones. For the best results, cars and buckets should be equipped with suitable dumping gates, through which the velocity of flow is controlled. The settling of heavy aggregates which may occur during transit is largely counteracted by the fact that the finer aggregates from the top tend to flow more rapidly when the bottom gate is opened than the heavier closely packed aggregate near the bottom. The result is a very satisfactory remixing. With cars or buckets that dump over the top this process is reversed; the fine material which has risen during transit is discharged first over the top, leaving the hard-packed aggregates with no chance of remixing, as the fine materials flow much faster than the heavy aggregate if separated. The importance of bottom-dumping equipment cannot be over emphasized.

The track for industrial cars should be free from abrupt turns or irregularities which transmit jolting action to the concrete.

DISTRIBUTION BY MOTOR TRUCKS

Motor truck distribution causes segregation of concrete while it is in transit, more than while it is being loaded or unloaded. This is due to the vibration that the concrete receives. Distribution by the ordinary open-top truck body is impractical because of the fact that when the concrete is discharged from the truck by elevating the forward end of the body, the fine materials, together with the excess water, are discharged first, followed by the heavy aggregate. Concrete handled in this manner requires complete remixing. Delays, if encountered, cause the concrete to become so firmly attached to the truck body that these heavier aggregates must be loosened with a pick. Trucks designed to carry a body shaped much like a concrete hoisting bucket, with discharge gates at the bottom, have given more efficient results, reducing to a considerable extent the segregation during transit and assisting in the remixing of the concrete when it is discharged.

An enterprising distributor of ready-mixed concrete in San Francisco has constructed on his trucks a long cylindrical mixing body into which dry materials for 3 yd. of concrete of given specifications are placed. Water for the batch is carried in a separate compartment on the truck. Upon arrival at the receiving hopper, the power from the truck engine is thrown into the mixing blades, the water added to the dry batch and freshly mixed concrete of any desired consistency is discharged from the truck. This development seems to be a step forward in the handling of concrete by truck, since it eliminates segregation during transit and removes dangers due to delays in transit.

DISTRIBUTION BY BELT CONVEYORS

Transportation by means of belt conveyors has been successfully used on core walls of dams and other works where sufficient volume of concrete warranted belt installations.

For well-mixed concrete having a slump of not over 5 in., practically no segregation of aggregates takes place on belts even on considerable inclines. Concrete of a sloppy consistency cannot be handled by inclined belts without marked segregation, as the fine materials tend to flow down the center of the incline leaving the larger aggregates on the edges of the belt. Proper loading and unloading arrangements for belt conveyors are important. Concrete conveyed by belts should be discharged into a receiving hopper of ample capacity, so that the concrete from the belt falls directly into a mass of concrete, and does not strike a sloping surface. Belt conveyors should be charged from a hopper through a bottom gate and not fed directly from a mixer chute. In this way the discharge can be gaged so that a continuous stream of concrete can be maintained on the belt with a single mixer, giving extremely uniform conditions of distribution.

DISTRIBUTION BY PNEUMATIC METHODS

On practically all tunnel work, placing concrete in the forms by means of pneumatic machines has been found most satisfactory and efficient.

In pneumatic placing, the discharge end presents the greatest liability for segregation of the aggregates. If the discharge line is simply extended into the section of tunnel lining to be concreted, the force of the air sends the heavy aggregate to the opposite end of the form, while the fine materials fall in a sharper curve with disastrous results. The discharge pipe should be carried to within a few feet of the far end of the form and be properly baffled. As filling progresses, short lengths of the discharge pipe are removed, until only a small space at the near end of the form remains open. This space is left until the next fill is made, forming a key between the sections. From a quality standpoint, pneumatic placing has everything in its favor. Inspection of tunnels shows that air-placed concrete is much freer from honeycombing than hand-placed concrete. Leakage through concrete placed by air is also much less.

DISTRIBUTION BY MOTOR TRUCKS

The use of admixtures is now steadily gaining

favor with those familiar with placing concrete. Authorities agree that changes in the final strength of concrete containing suitable proportions of proper admixtures will not vary much more than the percentage of the admixture used.

The real value of admixtures does not lie in added strength given to the concrete, but in increased workability. This is especially true with the leaner mixes. The larger aggregates in concrete containing admixtures seem to be coated more completely with a covering of fine material which clings to the aggregates, decreasing their rolling action but increasing their sliding qualities.

PLACING CONCRETE IN FORMS

The quality of concrete can be damaged considerably by careless placing in the forms. One of the fundamentals of placing is that concrete falling through space tends to segregate. Another is that the surface of flowing concrete must be kept approximately level. If these two points are well guarded, and care used in working the concrete against the form, and between the reinforcement, well-placed concrete will be the result.

While cleaning of forms may appear too commonplace for consideration, it is neverthless a factor in the proper placing of concrete and needs emphasis. The bearing value of columns or walls is decreased in proportion to the amount of refuse left in the forms.

Form details affect the appearance and quality of concrete, also. No large cracks between boards or panels can exist without draining some of the richest material from the concrete. Open spaces between concrete poured and forms about to be filled, cause most of the honeycombing seen near joints between fills. Often some portion of a structure calls for a richer mix than usual. In such cases the foreman should be supplied with a location plan showing the special portion marked distinctly and he should be checked up on the mix at the time of pouring. On difficult work it is not unreasonable to distribute the placing of vertical fills such as high columns or walls over an entire day, allowing generous settling periods between the pourings. Concrete should never be dumped onto the floor forms adjacent to a column or wall to flow over the edge into the form, but should be poured into a portable box having a 6-in. opening directly over the center of the column or wall.

When columns have spiral reinforcement, it is especially important to deposit the concrete inside of the spiral. When pouring such columns at least three wooden rods should be outside of the spiral. to insure the proper centering of it. Similar rods inside should be worked at intervals, to assist in compacting the concrete. It is safer and more satisfactory to fill supporting columns and floor on the same day, for the laitance which rises in the columns continues to rise to the top of the floor concrete. Rapping of the forms gently is of considerable assistance in increasing the flow of concrete around reinforcement and into corners. Continued vibration is not necessary on ordinary work, but is a valuable feature which must not be overlooked on complicated form work.

No excess water should accumulate on the floor panels in front of a floor pour, but the material should be kept workable enough to fill the forms completely. The practice of wheeling over concrete poured one or two days previous should be discouraged, especially during cold weather.

Far too little attention is paid to necessary clearance between the steel and the forms on most operations, although it is well known that steel left too close to the surface will in a short time force very sizeable pieces of concrete from the face of the struc- greatly affecting the appearance and ultimately the strength. While placing concrete, this point should receive the constant attention of the entire concrete gang, as well as the whole attention of at least one man assigned for the special purpose of keeping all steel back from exterior surfaces.

When considering methods to be used for handling concrete, it is well to remember that a thoroughly reliable and suitable set-up for distribution under one set of conditions may prove entirely out of place in different circumstances. In the selection and operation of all concrete-handling equipment, theoretical layouts and devices must be accepted only after they have been tested and found to work out to advantage under service conditions.

Cross Connections in Connecticut

The Public Health Council of the State Health Department of Connecticut last year adopted regulations which provided that after December 31, 1926, no cross connections shall exist between potable and non-potable water supplies, except that installations protected by double check valves of approved type, with adequate facilities for testing, which were in existence on December 31, 1926, may be temporarily permitted with the approval of the State Health Department. The latter provision was inserted because it was felt that double check valves of the latest approved types should be given a fair tryout. The length of the extension of time granted will depend upon the investigations which the Connecticut State Department of Health is making as to the efficiency of the newest types of check valves.

The health department's monthly bulletin states that the majority of cross connections in Connecticut have been eliminated and the work tending toward their elimination is still in progress. Some cities still have a considerable number of double check valves, either in existence previous to the passage of the regulations or since installed, but there is a markedly less hazard where these are in use than with the old neglected connections. In order to bring about complete separation, separate piping has been provided for polluted water in some; others have installed tanks filled with city water; city water to large tanks supplied by two sources has been made to discharge above water level; priming connections have been replaced by small tanks filled from above with city water; for boiler feed or other industrial use, swing joints with an elbow and unions have been used in the case of small diameter piping, whereby either of two supplies can be used but both can not be used at once. In some instances, piping systems have been found to be literally "sewed together" and much time and effort have been needed to separate them.

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No Water Works Cure-Alls

Water purification practices differ materially throughout the country, because of widely varying conditions. The highly turbid waters of Alabama and Georgia cannot well be made satisfactory for municipal use by processes adapted to either the colored waters of the eastern Carolinas or the clear waters of the northeastern states. A detention period of six hours is needed to provide adequate coagulation for Alabama waters, but less than half that time is sufficient in the two New England plants described elsewhere in this issue.

Waterworks superintendents and engineers, therefore, should use discrimination in selecting methods of procedure and not assume that what has proved succsessful in some other city will necessarily solve their own problems. A comparatively slight difference in pH value, presence of solids in colloidal form rather than free suspension, abundance or absence of algae growths in reservoirs, may easily cause a process which is a success in one plant to be a failure in another.

No more is there a cure-all for water works troubles than there is for human ailments. A superintendent should intelligently diagnose the conditions of his plant, or call in an expert water works diagnostician, before deciding upon a remedy.

Keep Informed on Purification Methods

Although conditions vary widely in different plants, there are few if any which can not be found duplicated in dozens of the many hundred plants in the country; and a treatment more or less successfully dealing with any given condition can probably be found in some of these similar plants. No water works man can be sure that he is solving his own problems in the most successful manner available until he has familiarized himself with what is being done at all plants which have conditions resembling his own.

Few water works men can visit every new water works of importance; usually time and money are lacking for more than an occasional convention trip. Yet it is important for them to keep up with late developments in the field, and to be acquainted with the problems of others; and the methods of solving them. Here is a real service the technical magazine may perform. It can bring to its readers the latest developments in the field; it can describe, with the aid of photographs and drawings, with unimportant details eliminated, the most modern and typical installations. This material, edited and arranged by highly trained men, who are specialists in their field, presents the basic data in the most easily understood form.

This is a service PUBLIC WORKS aims to perform. From time to time in succeeding issues, it will present descriptions of water purification plants from all sections of the country, illustrative of the various conditions to be overcome and the practices followed.

New Appliances

The construction job of today differs greatly from that of 1914. In those days, labor was cheap, and an average gang to operate a paving mixer was 30 or 35 men. Today the contractor, by replacing men with machinery, cuts his costs to a point that was not

considered possible a comparatively few years ago. Unless he uses the very latest in labor saving machinery he loses out. Contracting is a highly competitive business, and there is no mercy for those who fall behind.

It is to keep our readers informed concerning the very latest labor and money saving devices that we maintain our "New Appliances" section, which will be found following the main editorial section. Doubtless some of our readers who are not in the construction game consider these pages as reserved for "puffs" for advertisers; but the construction men appreciate them. This section treats alike advertiser and non-advertiser, the only object being to give up-to-the-minute information about moneysaving machinery available for construction men. We want this section to be as valuable as possible and to that end are always glad to receive constructive suggestions regarding it.

Cheap Waters for Industries

The Chamber of Commerce of the United States has investigated the practice of bonus giving as a method of inducing industries to locate in communities, and reports that "Whenever we investigate the result of giving bonuses we invariably find many more failures than successes. . . . The Secretary of the Lincoln, Nebraska, Chamber of Commerce writes: 'Our people have wasted between two and three million dollars in bonuses, and it is a sad commentary to record that not a single industry bonused in any way, either by the donation of free sites, tax exemption, selling of stock, or otherwise, is in existence here today. Every one of them failed."

In a number of cases cities have offered industries free water from the municipal water supply as an inducement; while in a great many other cases cities furnish water at a rate below the cost of production. This of course means that the other consumers or taxpayers must make up the deficit, and this, like the tax exemption referred to by the Lincoln secretary, is a form of bonus giving.

It would appear that an industry which requires special favors from the municipality to enable it to continue operation is seldom an asset to a community and may be or soon become an actual liability.

There are probably many cities which are presenting bonuses of this kind to their large industries without the knowledge of the taxpayers, perhaps without the knowledge of the industry itself, and even without the knowledge of the superintendent or any other official connected with the water works. We believe that such a bonus is not good policy from any point of view and should be discontinued wherever found. Every superintendent should know what it costs his plant to deliver water into the mains, this including interest, sinking fund and such other charges as would be included in the analysis of the finances of a private business. This divided by the total amount of water furnished, including that furnished free to the city for sewer flushing and street sprinkling, etc. and to municipal or charitable institutions, and all other water actually used, but not including that lost in the ground by leakage, will give the cost per thousand gallons of furnishing the water, and no industry should receive water for less than this amount. In making up the rate there must be added to this the cost of distribution service, including service pipe, meters, billing and other office expenses in connection with collection of the water rate. If this be apportioned to the different classes of consumers in proportion to the average actual costs, it will add much more pro rata to the rate for the small consumer than for the large consumer, and this is thought by many, if not most, investigators of the subject to offer all the advantage which the large consumer should expect over the small one.

Municipal Reports

A number of letters have been received endorsing the statements made by us editorially in the July issue under the heading "Reports by Municipal Departments." We are also glad to note that the requests for such reports has resulted in an increased number of these reaching our office.

Among the reports recently received is one from the city manager of Alliance, Nebraska, for the year 1926, in which we find the following statement: "Realizing that tabulations of figures and statistics, no matter how accurate and pertinent to the subject matter, are at the best only dry reading and are for the most part not read at all by those upon whom reports are inflicted, we tried to avoid this method as far as consistent. We have attempted herein to tell in simple narrative form the principal things that each department has done during the year, with reference to failures and omissions as well as to accomplishments." This appears in the introduction to the second part of the report, the first part consisting of the Treasurer's report analyzing the expenditures and receipts of the city during the previous six months. This separation of the report into two parts, one of which gives the financial and statistical details while the other discusses in a more general way the work done and that which is recommended for the future, seems to be an excellent way of enabling the taxpayers and voters to obtain general information concerning the workings of the various departments of the Government without requiring them to search out these general facts from a mass of figures and statistics that are confusing to the average citizen.

Paraffin for Cement Briquette Molds

Paraffin solution has been found to be much better than oil for preventing cement mortar from adhering to briquette molds, glass plates, or any other laboratory apparatus, according to R. B. Dayton, materials engineer of the State Road Commission of West Virginia.

A 6 to 7 per cent solution of paraffin in carbon tetrachloride is used instead of the customary heavy mineral oil. It may be applied with either a brush or rag. The surfaces of the molds are very easy to clean, requiring but slight brushing with a stiff fiber brush. The top and bottom of briquette molds require a slight scraping with a small trowel to remove the mortar, as the process of forming removes the paraffin coating, but this also happens when oil is used.

One advantage of the paraffin solution over oil is that the paraffin solution is quick drying and does

not become incorporated with the mortar as sometimes happens with excess oil on the molds and plates.

Assessment of Cost of Paving Intersections*

By John Simpson

APPORTIONMENT OF COST

Indiana Acts 1919, C. 142 amends the Municipal Code, Sec. 108, so as to require the total cost of improvements in cities of the first class to be apportioned upon abutting lots, except one half of the cost of street and alley intersections, which is to be apportioned upon the lands or lots abutting on the street or alley under improvement for a distance to the street line of the first street intersecting the intersecting street in either direction from the street improved. It was held error to modify an assessment against the corner lots by distributing it between the corner lots and the lots fronting on intersecting streets back to the depth of 150 feet from the improved street; 65 per cent against the corner lots and 35 per cent on the lots fronting on the intersecting streets, none of the latter property abutting on the improved street and no part of the assessments against their property being for street or alley intersection. Aty. v. City of Indianapolis, Indiana Appellate Court, April 21, 1927, 156 N. E. 178.

The Ohio Supreme Court holds, Creighton v. Scott, 14 Ohio St. 438, that the squares formed by the intersection of other streets with the street or avenue directed to be improved, "form, in common, parts of both streets, and are to be improved as the other portions. It is the duty of the city council to determine to which of the streets, thus occupying ground in common, the expense of improvement, in any given case, is to be appropriated; or whether to both. If the necessity and object are for the improvement of only one of the streets, and in making the improvement across the square the other is incidentally affected, we think the whole expense may be assessed upon the same property on which the other expenses of the improvement are assessed."

Under the Iowa statutes providing that the cost of paving a street may be assessed to the abutting property, it is held that property abutting that portion of the street improved, though not at the corner of the intersection, may be assessed for its proportion of the cost of the intersection. "An intersection is as important as any other part of the street, and the improvement is not complete unless it covers such intersection." Perry v. City of Albia (1912) 155 Iowa 550.

Under a Pennsylvania statute authorizing the municipality to assess two-thirds of the improvement on the abutting owners, and the ordinance following the statute, it was held that two-thirds of the cost of paving the intersections was to be assessed pro rata on the lot owners. Kennett Square v. Entriken, 7 Pa. Co. Ct. 469.

*Continued from page 308.

The Oregon Supreme Court, in King v. Portland, 38 Or. 402, held that a statute requiring a city council to assess against abutting lots in a city the cost of improving the half street immediately in front of such lots, and providing that the cost of improving street intersections shall be assessed five-ninths to the first fifty feet, and the remainder to the next fifty feet, in the abutting quarter blocks, did not provide a rule for assessing the cost of the improvement which made the charge against each lot so in excess of or out of proportion to the benefits received as to be a taking of property for public use without compensation, in violation of the fifth amendment to the federal constitution.

Where a street was paved on the application of abutting owners, it was objected by certain of them that all the costs were assessed on the property holders on the street and contended that part of the cost of paving the intersections should either have been placed upon owners of lots on the intersecting streets or have been assumed by the city. It was held that as the property owners on the cross streets did not apply for the improvement, the council had no power to make them contribute to the expense of making it. State v. Council of Elizabeth (1863) 30 N. J. L. 365.

The statute may provide that the cost of paving intersections shall be assessed on the four quarter blocks cornering on the intersections, each lot according to its frontage on the main street. Parker v. Reay (1888) 75 Cal. 103, 18 Pac. 124.

A statute providing for the assessment of lots fronting upon or lying along the street, avenue, or alley which is to be improved, or is improved, was held to authorize an ordinance assessing upon each corner lot the cost of paving one-fourth of the square formed by the intersection of the streets. Wolf v. City of Keokuk, 48 Iowa 129.

Or a statute may charge the lots in a block for two quarters of the two street intersections, one at each corner of the block, according to the frontage of each lot in the block. Sedalia v. Coleman (1890) 82 Mo. App. 560; Lexington v. Long (1861) 31 Mo. 369.

TAXATION OF INTERSECTIONS

The statute may class the city as the owner of intersecting streets and provide that it pay its share of the improvement according to the frontage of the intersections.

A statute empowering a city to adopt an ordinance assessing two-thirds of the cost of street paving improvements on the property abutting on the street, provided that the municipality should be treated as the owner of all intersecting streets and should pay a just pro rata of the entire cost according to the frontage of the intersections. It was held that the method of assessment prescribed by the act must be strictly pursued. Bacon v. Mayor, etc., of Savannah (1893) 91 Ga. 500.

In Illinois it has been held that property owned by the municipality, such as a public square, may be assessed for the improvement of a street on the side of it. But it has never been held in the absence of a statute specifically providing therefor, that the street upon which the improvement is made is subject to assessment for the improvement. Consequently it is held that cross street intersections, not

being abutting property, cannot be assessed for the improvement. Walters v. Town of Lake (1889) 129 Ill. 23; Holt v. East St. Louis (1894) 150 Ill. 530.

Idaho Rev. Codes Sec. 2238 (now Comp. St. Sec. 4001) provides that the expense of all improvements in the space formed by the junction of two or more streets, wherein one main street terminates in or crosses another main street, and all street crossings or cross-walks shall be paid by the city. Byrns v. City of Moscow, 21 Idaho 398. The statute, however, it is held, does not contemplate providing by ordinance for the city paying for paving the spaces included in intersections of streets with alleys. "An alley," the court said, "is clearly a convenience and benefit to the abutting lots only, and it is not a general convenience of necessity to the city at large. It follows, therefore, that the pavement of that part of the street immediately in front of an alley or abutting on an alley should be paid for by the property owners. If, therefore, the pavement of this part of the street is paid for out of the general fund of the improvement district, the expense thereof will in the last analysis fall upon the property receiving the benefit." Clyde v. City of Moscow, 23 Idaho 592.

Where a city charter provides that the paving of a street should be at the expense of the owners of the lots lying thereon, the owners of the land in an intersecting street were held not chargeable with the cost of paving that part of the improvement in front of the intersecting street. The fee of a street is of such inconsiderable value that the owner thereof is rarely, if ever, spoken of as the owner of a street, and the word "lot" could not be held to designate land in an open street. "Under the city charter the paving in front of these open streets could be done at the expense of the city, and equitably and justly it should be so done." Schenectady v. Trustees of Union College (1894) 144 N. Y. 241.

In Cunningham v. City of Peoria, 157 Ill., 499, it was held that an ordinance providing for taxation "upon the lots, blocks, tracts or parcels of land contiguous to the improvement," did not include, or intend to include, among the property to the taxed, the streets which abut upon or intersect the avenue to be improved. The court added: "While it is true, as has been held in some cases, that the land included in abutting streets may, under proper circumstances be made the subject of assessment for local improvements, it will not be presumed that the streets are intended to be included in general specifications, which do not in terms include them."

INTERSECTIONS AT ENDS OF STREET IMPROVED

An objection that an extension of a street improvement to the middle line of the cross street at either end of the block created no proper charge against an owner of property between the proximate lines of the cross streets was rejected in Gibson v. Kayser's Executor, 16 Mo. App. 404, for the reason that if the objection was well founded, there is at every intersection a square of ground, defined by the exterior lines of the two streets, the cost of whose improvement cannot be assessed against any property owner. The ordinance here expressly provided for "making all proper connections and intersections with other streets and alleys" and charging these as a lien on "the adjoining property fronting or bordering on the improvement."

In matter of Murphy, 20 Hun (N. Y.) 346, it was held that a resolution directing the paving of Madison Avenue, New York, from 42nd to 86th Streets "and that at the several intersecting streets and avenues crosswalks be laid" authorized the paving of 86th street as being one of the intersecting streets.

SIDEWALKS AT INTERSECTIONS

The cost of the sidewalks at intersections of streets was held properly included in the cost of a street improvement made under the Illinois Local Improvement Act, it being held that there is no difference, in principle, between such an assessment to build sidewalks and one to pave streets. Gage v. City of Chicago, 192 Ill. 586.

DOUBLE TAXATION

The Illinois Supreme Court holds, Chicago Union Traction Co. v. City of Chicago, 208 Ill. 187, that a paving ordinance which, if enforced as adopted, will impose a double burden of taxation as to street intersections provided for in former ordinances under which the work is proceeding, is oppressing, and the court has no power to hold it inoperative as to such street intersections and enforce it as to the remainder of the improvement.

But double assessment is not effected by two ordinances assessing for the same intersections, the second of which repeals the first. Noonan v. People, 183 Ill. 52.

Iron Pipe Prices

The present would seem to be a good time for water works men to lay in iron pipe or to do such extension work as may be needed in the near future, as prices of cast iron pipe are lower than they have been for some time. Whether they will go still lower or will remain at the present low level it does not seem possible to predict. At the time of this writing, cast iron pipe, 6-inch and over, is quoted at $34 in Birmingham, $42 in Burlington, N. J., and $44.60 in New York City. A year ago the same pipe was quoted at $51.60 to $53.60 at New York. In fact, the "Daily Metal Trade" says that prices in New York are the lowest since 1917, and that at Birmingham and Chicago the prices are the lowest for five years past. Birmingham quotations for pig iron are $17.25 per ton as compared to $21 a year ago.

Commenting upon the cause of these lower prices, the "Daily Metal Trade" says: "The answer appears to lie chiefly in the modernizing of facilities, always conducive to cheaper production, and in the substantially increased capacity, compared with this time last year. . . . Important, too, has been the psychological effect of the general downward trend in buying, even though slight. The downward trend of raw material, notably pig iron and coke, has undoubtedly had an influence, and another factor, although possibly over-emphasized at times in certain districts, has been foreign competition. While foreign pipe has been coming into this country at an annual rate of possibly 90,000 tons or so, a rela-

tively small percentage of the country's total production, it has had, nevertheless, a softening influence on prices."

Wrought iron and steel quotations are the same as a year ago in New York and St. Louis, and seven to ten per cent. higher in Chicago.

Trucking Road Gravel

How an Iowa Contractor Handles Large Jobs of Hauling Gravel with Motor Trucks, Most of Them Owned by Sub-Contractors.

The M. O. Weaver Construction Co., Iowa Falls, Iowa, employs forty-two motor trucks for hauling gravel for road work, most of them 3-ton units. Of these trucks only three are the property of the company, the others belonging to sub-contractors, twenty-three of whom own single units, each driven by the owner; but all of them are Internationals, thus securing the operating and maintenance advantages of uniformity of equipment.

When this company is the successful bidder on a graveling project, it in turn lets the hauling at a contract price of so much per cubic yard per mile, which usually is from 12 to 14 cents. The same motor truck operators usually go from project to project; however, if there is need for another operator, the applicant, in order to qualify for the work, must either own or purchase an International. In purchasing the truck, moreover, he must have enough money to make the first payment thereon; the deferred payments, then, as well as operating expenses being deducted from the truck earnings.

The motor trucks are divided into fleets according to the number of gravel pits worked. The men who operate the trucks and the men who work in and around the pits live in camps nearby. In many cases the men are accompanied by their families and live in tents or portable houses. A kitchen is maintained at each camp for those men who do not live with their families, and food is served at 40 cents a meal or $7.50 a week. Last season, there were two major camps. Each camp is in charge of a foreman. A mechanic, a man in charge of fuel and oil disbursements, another at the loading hopper, teamsters and a cook are also employed at each camp.

LOADING THREE-TON TRUCK FROM OVERHEAD HOPPER

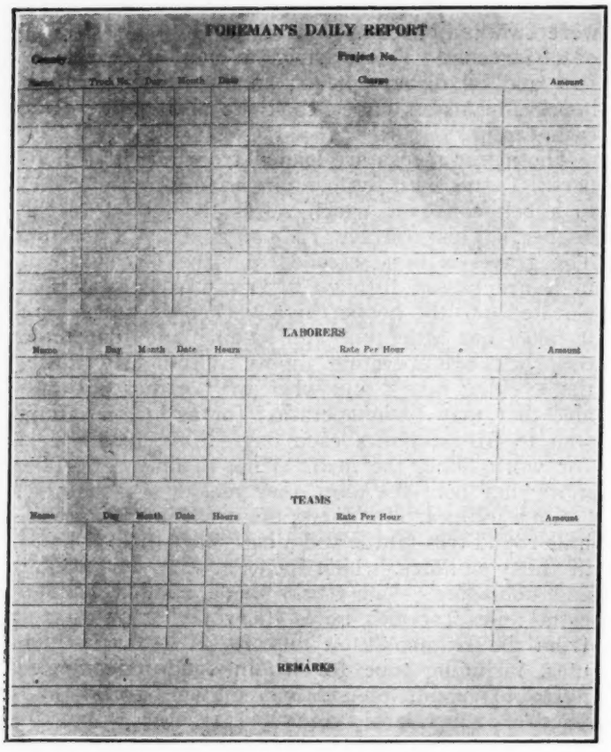
The motor trucks are loaded from overhead hoppers. Teams with scrapers are used to bring gravel to a belt conveyor which raises the gravel to the hopper. This conveyor is operated by a tractor. The gravel is first screened and the larger stones in it are passed through a rock crusher and then elevated into the hopper by a bucket elevator. Since it takes but little time for loading and unloading, the trucks are operating almost continuously during the working hours, and when the weather is favorable they may be in operation for as long as fourteen to fifteen hours each day. Since payment is for work done, the men do not complain, for the more they haul the more they make.

On a job near Humboldt, the trucks made a seven-mile round trip (three and a half miles of load haul) in thirty minutes, which included time for loading and unloading. The trucks made another haul of eight miles (sixteen miles the round trip) to and from the Humboldt pit in forty-five to fifty minutes, including time for loading and unloading.

Disbursements of gasoline, oil and grease, supplies of which are maintained at each camp, are recorded on special tickets and are charged to each truck account. Each driver takes care of his truck and makes minor repairs with the assistance and under the direction of the camp mechanic. Major repairs and the annual overhauling for each truck are done at the nearest company service stations. Correct maintenance practices help very much toward keeping down the repair charges. The necessity of proper maintenance is stressed; and it is part of the duties of the camp foreman and mechanic to check up on the men in this work.

Records are carefully kept of all operations and costs. The foreman of each camp makes out a daily report which is sent in to the main office at Iowa Falls. Records of gravel hauled by the various trucks are also sent in to this office on special check sheets by inspectors employed by counties at the places where gravel is delivered. A special account is kept at the Iowa Falls office on each truck. On the debit side are posted all charges sent in by the foreman such as those for oil, grease, fuel, repairs, etc., and also any advances or truck payments made from the main office. On the credit side are entered the number of loads hauled each day, the total quantities as reported by the county engineers and the amount of money to be paid based on the contract

SPREADING GRAVEL ON ROAD



FOREMAN'S DAILY REPORT

County Project No.

Name | Truck No. | Day | Month | Date | Charge | Amount

LABORERS

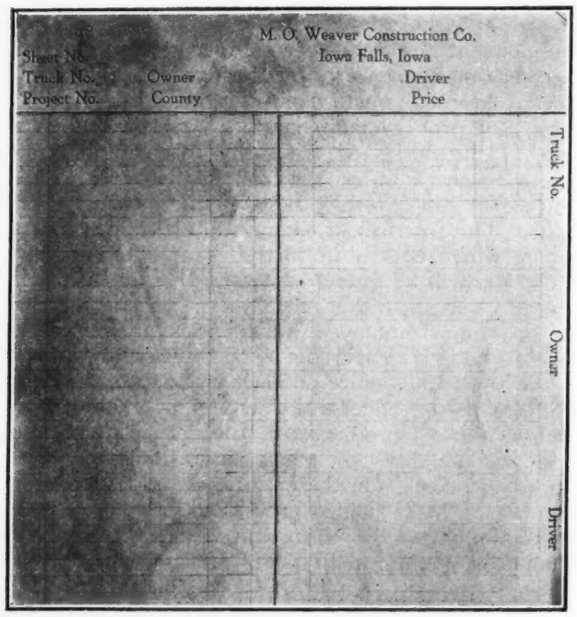
Name | Day | Month | Date | Hours | Rate Per Hour | Amount

TEAMS

Name | Day | Month | Date | Hours | Rate Per Hour | Amount

REMARKS

BLANK FOR CAMP FOREMAN'S DAILY REPORT



M. O. Weaver Construction Co.
Iowa Falls, Iowa

Sheet No.
Truck No. Owner Driver
Project No. County Price

Truck No.
Owner
Driver

LEDGER SHEET, ONE KEPT FOR EACH TRUCK

price per cubic yard per mile. Periodically the account is balanced and a carbon sheet sent to each driver.

To save labor and to speed the work of distributing the gravel after it has been dumped on the road, the M. O. Weaver Construction Company makes use of a McCormick-Deering tractor equipped with a Gilbert road grader.

Civil Service in New Bedford

In his annual report for 1926, W. P. Hammersley, superintendent of streets of New Bedford, Mass., calls the present civil service laws and rules of that city "one of the greatest obstacles to efficient management of this department." Said he:

"Civil Service was originally instituted to provide, by tests and examinations, employees particularly fitted for the positions to be filled; but gradually by rules formulated by the commissioners, which have the power of law, they have become a protection to the employee at the expense of the taxpayers and the morale of the Department.

"A new rule, effective Feb. 1, 1926, known as the "seniority rule," has added greatly to the cost of our work. It provides:

> If the suspension is the result of lack of work because of the season, or any other temporary cause, such as the lack of money, laborers shall be suspended according to their seniority in the service, the oldest employee in point of service being retained the longest and re-employed first. All laborers so suspended shall be re-employed before new names are certified, unless the Commissioner shall otherwise direct.

"No explanation is needed to show how impracticable is such a rule.

"Given freedom in the matter of 'hiring and firing,' and in placing the men to the best advantage, there is no reason why the work of the department cannot be done as effectively and economically as by contract.

"As I view the situation, the Street Department is more completely and effectively unionized under Civil Service than would be possible by the concerted effort of the employees themselves."

Sewage Treatment at Schenectady

Plant efficient in spite of overloading. Sludge and screenings for fertilizer. Operating overloaded Imhoff tanks. Investigations in odor and fly control.

In his report to Henry B. Parker, commissioner of public works of Schenectady, New York, for the year 1926, Morris M. Cohn, superintendent of the Bureau of Sewage Disposal, states that good efficiency has been maintained in the operation of the disposal plant, in spite of the fact that the Imhoff tanks are greatly overloaded and the rate of flow is irregular, the daily flow varying from a minimum of 3,600,000 gallons per day to a maximum of 11,000,000 and even to 14,000,000 gallons for short periods. These maximum rates are reported to be due to the entrance of storm water into the sanitary sewer system.

SLUDGE AND SCREENINGS

On entering the plant, the sewage passes through a stationary bar rack, which intercepted a total of 243.5 cu. yds. of screenings, or an average of 2 cu. ft. per million gallons of sewage. The screenings were wheeled to a dump during the winter months and piled on the ground, and this accumulation was

disposed of by trenching in the spring, except for about 40 yards which was hauled away for trial as fertilizer by a farmer during December. During the summer months the screenings were hauled to the plowing ground and turned under the soil once a week. There were no odors from this source. The plot used for this purpose in 1925 was plowed and dragged in the fall of 1926 and it was planned to plant corn there in the past spring of 1927. Although the farmers have begun using sludge for fertilizer, attempts to interest them in the use of screenings for this purpose had been unsuccessful.

The success of Schenectady in selling sludge to farmers was described in PUBLIC WORKS a year ago. Practically all of the sludge was removed from the sludge piles during the winter of 1926. At the time of writing the report, in December 1926, a total of 772 loads of sludge, or roughly 1,800 yds., had been sold during the year at 25c a load. Many of the farmers have stated their willingness to pay more for the sludge if the loading facilities were improved so that they could obtain their loads more rapidly. "The local farmers are this fall reporting successful crops as a result of the use of sludge, despite the dry weather they experienced during the fore part of the summer. Much sludge was given last spring to local householders in small quantities, in order to ascertain its value on lawns and backyard gardens. If this use is successful it may open up another market for sludge, and it may aid in interesting many citizens in the working of the treatment plant. About 75 loads were sold to householders for use on community garden plots located at the plant site."

The sludge drawn from the Imhoff tanks cracked within 48 hours and dried to a cake averaging 4 inches thick and containing about 60% moisture, the drying period varying from 11 days to 42 days. During the winter the sludge is removed by farmers in a frozen condition, taking a minimum quantity of sand with it, and leaving the beds in condition to receive sludge early in the spring.

IMHOFF TANKS

At the end of sludge drawing in the fall, a scum blanket about 18 inches deep remained in the tanks and a negligible amount of sludge in the bottom. Owing to the freezing of the scum and continued gasification of the sludge, solids boiled up more or less through the slot into the sedimentation compartment in December. In February, solids began to gather above the slots and it was obvious that the scum had built down to the plane of the slot. Various means were tried of freeing the slots, but all were unsuccessful. Attempts to draw sludge indicated that an appreciable amount of solids was present in the sludge hoppers. This condition existed until the early part of April, when hosing of the scum began, and in May the drawing of sludge was started. Screens have to be maintained at the effluent end of the tank to prevent floating sludge therein passing to the filters, and it was necessary to continuously clean these and also skim off floating sludge from the surface of the tank. However, the tank surfaces cleared up after each sludge withdrawal and presented a neat appearance during the summer and fall.

In spite of the excessive quantity of solids in the gas vents, warm weather did not produce active foaming, owing to the fact that hosing of the deposits was started as soon as water could be turned on without freezing, and the active program of sludge withdrawal was well under way before the temperature of the sludge compartment rose to the point of active digestion. Slight foaming tendencies were observed on the 30th of May and continued to a slight extent through June, but little foaming matter entered the sedimentation compartments.

Sludge withdrawal continued from the second week in May until the last wek in November, and early in December there was little sludge in the sludge hoppers and about 12 inches depth of scum.

The efficiency of removal of suspended solids by the tanks, as measured by chemical analyses, varied from a minimum of 56.2% in May to the maximum of 76.5% in November. The efficiency of sedimentation exceeded 60% during all but three months of the year.

Hosing gas vents decreased the tank efficiency greatly, the agitation of the solid matter forcing solids and septic liquid up into the flowing-through compartment, whereby the effluent is full of colloidal and fine suspended matter. The installation of mechanical agitators would solve this problem, but the expense is prohibitive.

TRICKLING FILTERS

Ice first formed on the beds in December and the mounds encircling the nozzles grew with each snowstorm. An average of about 10% of the bed area was covered with ice from December until the end of March, hampering maintenance work. Unloading was evident in December and ceased in January, and the second normal period started in October. (Chlorination for fly control caused frequent unloading, as described further on.) The gallery floors and channels were flushed of their accumulation of solids in the early summer.

RESULTS

The total solids averaged 553 p.p.m. in the crude sewage, of which 386 were in solution in crude sewage, tank effluent and final effluent. Of the 167 parts suspended solids, 154 were settleable, there remaining 57 parts suspended solids in the tank effluent and 59 parts in the final effluent. The tank effluent showed 9.3% saturation of dissolved oxygen, and the final effluent 39.6; while the biochemical oxygen demand was reduced from 131.9 in the crude sewage to 68.9 in the tank effluent and 28.7 in the final effluent. The pH was 7.2 in the crude, 6.8 in tank effluent and 7.1 in final effluent.

INVESTIGATIONS

Investigation was carried on during the year in odor control, fly control, extermination of rats, and other details of operation. For exterminating rats various kinds of poison were tried but the most successful method was pumping calcium cyanide into the rat runways by means of a special foot pump. This combined with moisture to produce hydrocyanic acid gas, which killed most of the rats. Keeping the screenings plowed under helped to keep down the number by removing a ready food supply.

Odor Control—The work done during the year on control of odors from the Imhoff tanks, dosing tanks and trickling filters was most promising. Chlorine was applied to the raw sewage entering both

the batteries of Imhoff tanks at a rate of 6 p.p.m. and observations made on the tank effluent to ascertain the effect on odors. The chlorine effected a marked reduction in the hydrogen sulphide content and the chlorine demand of the tank effluent was always reduced in very great measure. Parallel tests run with one battery being prechlorinated and the other without treatment indicated that the hydrogen sulphide content of the effluent of the treated battery was markedly lower than the content of the untreated effluent. There was a distinct difference in the odor emanating from the two siphons. The treated effluent had a fresh clean chlor-amine odor when agitated by the weirs and steps in the siphon chamber, while the normal effluent smelled distinctly of hydrogen sulphide. The b. o. d. of the treated tank effluent averaged about 30% lower than the b. o. d. of the normal effluent. The treated tanks had a fresher appearance and the color ranged from a grey in the morning to a brown in the afternoon, against a dark grey to black in the untreated tanks. The spray thrown by the nozzles on the beds receiving prechlorinated sewage was fresh-smelling while the other beds gave off the characteristic semi-septic odor. With a 6 p.p.m. rate of chlorine application, no evidences of residual chlorine could be detected at any point in the tanks or in the effluent.

A split chlorination study carried out in order to ascertain the economy of adding a portion of the total dosage of chlorine to the raw sewage and the balance after the sewage had passed through the tanks, indicated that no real saving could be effected by this means. The tests showed that it required as much chlorine in this split application manner to produce a certain residual chlorine at the nozzles as it did by direct application to the dosing tank. If a residual chlorine is desired at the nozzles, either for odor or fly control or for sterilization purposes, split chlorination will have the advantage of producing odor elimination in the tanks themselves at no added cost for gas.

Fly Control—The work done on fly control about the trickling filters has been as comprehensive as any carried out in the country. The application of from 60 to 90 lbs. of hypo to each acre of filters once weekly was started in May and continued until July. This method of control gave about the same fair result as was obtained last summer. Each application of bleach produced a decrease in fly life but the adverse weather conditions were favorable for fly development and some other means of fly elimination was sought. The Chlorine Institute of New York again agreed to supply all of the chlorine and chlorine control equipment necessary for the application of the gas to the raw sewage for the odor control work and to the filters for the control of psychoda. It was noticed in 1925, when Gallery "B" beds were receiving chlorine at heavy doses, that the surface film was removed from the media and that the fly life on these treated units decreased markedly. The fly control work this year was carried out on the theory that periodic applications of chlorine would eliminate and prevent the development of this film and that the breeding ground of the psychoda would thus be destroyed.

Chlorination for this purpose was started during the first week in July, when each portion of the beds was treated with tank effluent dosed with about 30 p.p.m. of liquid chlorine for a period of 48 hours. The heavy, black film on the beds was immediately bleached out and washed into the beds and the fly population decreased about 95%. Larvae counts made on the surface stone indicated that but 2 to 5 live larvae could be found per one hundred stones in comparison with the scores that could be counted on each stone prior to the study. Chlorination then ceased for two weeks, in which time the flies again developed in numbers, and after this period each bed was given a 24 hr. dose of chlorinated sewage at the rate of roughly 30 p.p.m. This type of treatment continued during the entire summer. Psychoda were extremely scarce during the sultry months of July and August but were much heavier in September. At all times, chlorination produced a sharp reduction in the number of larvae immediately after the 24 hr. treatment and the adult flies gradually decreased in quantity until they reached a minimum about five days after the treatment was started. This lag in actual fly reduction was due to the fact that chlorination had no effect on the adult flies and that they had to complete their normal life stage before their numbers showed the expected decrease. It is evident that the effectiveness of the chlorine depended on its ability to destroy the surface film and wash the larvae down into the beds. It can be said that the summer of 1926 saw a smaller psychoda population than has ever before been present about the Schenectady filters.

Investigation of the character of effluent produced this summer indicated that the chlorine treatment results in a reduction in nitrification efficiency. It was found that nitrification dropped at each application period and came back to normal within about five days after the treatment was ended. This treatment produced rapid unloading of the filters and the beds were never pooling. It is encouraging to note that the efficiency of nitrification of the units rose to normal and above shortly after the psychoda study was discontinued and indications are that this efficiency will remain high despite the advent of cold weather. It is noticeable that the production of oxidized nitrogen was higher in November than it had been during the entire year. It is certain that the normal seasonal unloading will not be as marked and this in itself should make for a more excellent effluent during the coming winter months.

Many other methods of fly control were used. The beds were flooded during June and this killed innumerable flies. This procedure is not easily carried out at Schenectady and structurally endangers the filter units. Dichlorbenzene mixture was used with remarkable success as a spray about the gallery walls, as was a mixture of one part dichlorbenzene and one part kerosene. This spray was especially deadly to the flies when they deserted the beds, due to the heavy chlorination the units were receiving, and gathered on the side walls of the galleries. The semicircles of gelatinous growth on the gallery walls produced by the spray were scraped off on several occasions to prevent fly and mosquito breeding. A portion of the beds was hosed with a water stream in an attempt to mechanically wash the larvae, pupae and eggs of the psychoda down into the beds. By all these means, psychoda were kept under excellent control except for one occasion during the summer.

Recent Legal Decisions

CITY'S RIGHT TO RELET ABANDONED PUBLIC WORKS CONTRACT

The contract for construction of a public improvement provided that if the work should be abandoned the borough president might declare the contract abandoned; and should then have power to contract for its completion in the manner prescribed by law, the contractor to pay any excess in cost. Greater New York Charter, §419, requires advertisement and sealed bids for work necessary to complete a particular job. The contractor notified the city he was unable to complete the work and the city declared the contract abandoned, declined to allow the contractor's surety to complete the work, readvertised the contract for public bidding, and the work was completed at an excess over the original contract price. The city sued the contractor and his surety for the excess. It was held, City of New York v. Duffy, 221 N. Y. Supp. 247, that although the city might properly have allowed the surety to finish the work, it was not, under the contract, bound to do so. The surety could have bid or procured a bid on its behalf. The city was therefore held entitled to recover the excess.

WAIVER OF BUILDING PERMIT REQUIREMENTS

When work on a building was commenced and continued with the knowledge of village authorities, and during the course of the work street opening and plumbing permits were duly issued, the New York Appellate Division held, John F. Kaiser Co. v. Ebler, 221 N. Y. Supp. 520, that such action on the part of the village authorities constituted a waiver of the requirement of a building permit.

ASSESSMENT OF BUILDINGS IN COURSE OF CONSTRUCTION

The placing of footings to support steel columns is a commencement of construction of a hotel building within the meaning of Greater New York Charter §889a, providing that: A building in the course of construction, commenced since the preceding first day of October and not ready for occupancy, shall not be assessed. People v. Goldfogle, N. Y. App. Div., 221 N. Y. Supp. 583.

WORK DONE UNDER VOID ROAD CONSTRUCTION CONTRACT

Under Arkansas Const. art. 13, §5 and Acts 1874-75, p. 134, dividing Sebastian county into two districts, a contract authorized by one of the districts for the construction of a road extending into the other district, which never authorized or approved the contract, was void. Failure to include the statutory requirements in the contractor's bond and to have it approved by the clerk of the circuit court would itself have rendered the contract void. The surety completing the work under this void contract could not recover percentages which should have been withheld from the contractor by the county, the provision therefor being part of the contract and falling therewith. Southern Supply Co. v. F. Smith Dist. C. C. A., 8th circuit, 17 Fed (2d) 63.

VALIDITY OF PAVING WARRANTS

Paving warrants issued by a city are prima facie valid, and the burden is on the city to prove that recitals therein and in the ordinances authorizing them are untrue. It was immaterial whether the ordinances were adopted at a regular or a special meeting of the council, if all the council members were present and participated in their adoption. The decision of the State Supreme Court that the city had not exceeded its bonded indebtedness limit when the warrants were issued under Texas Civ. Stat. 1914, art, 1096d, was accepted by the federal court. City of Pelton v. Brown-Crummer Inv. Co., C.C.A., 5th circuit, 17 Fed. (2d), 70.

LAW GOVERNING PUBLIC WORKS CONTRACTOR'S BONDS

The bond of a public contractor, given in New Mexico for work done under a public works contract in that state is governed by the law of that state, and rights created thereby are enforceable in courts of other jurisdictions. Such a bond inures to the benefit of furnishers of labor, materials and supplies to the contractor for performance of the work contracted for. First Nat. Bank of Hot Springs v. Caples, C.C.A., 5th Circuit, 17 Fed. (2d) 87.

A bond executed by a contractor on a public works contract made and to be performed in Montana, which contained an obligation to pay those furnishing labor and material created no obligation in favor of a materialman which it could enforce in its own name, notwithstanding Montana Rev. Code 1921, Section 7472, providing that a contract made expressly for the benefit of a third persons may be enforced by him at any time before rescission by the parties. It was conceded that the rule established in Montana as to the rights of third persons for whose benefit contracts have been made is opposed to the weight of modern authority; but it rests upon the construction by the State Courts of a State statute, and is binding on the federal court. Federal Supply Co. v. Minneapolis Steel & Machinery Co., C.C.A., 9th circuit, 17 Fed. (2nd) 242.

INJURY TO EMPLOYEE NOT COVERED BY GOVERNMENT CONTRACTOR'S BOND

The statutory bond by a contractor on public work for the United States is for the benefit of the United States and of those supplying materials and labor in the prosection of the work. A provision in such a contract that the contractor "shall be responsible for all damages to person or property which may occur in connection with the prosection of the work" does not impose any liability on the contractor to which he would not otherwise be subject, nor give a right of action on the bond for a personal injury sustained by an employee of the contractor in the performance of the work. United States v. Massachusetts Bonding & Ins. Co., C.C.A., 6th circuit, 18 Fed. (2nd) 203.

ANIMAL FEED SUPPLIED TO GRADING CONTRACTOR HELD COVERED BY HIS BOND

Under Mississippi Laws 1918, c. 217, a bond providing for payment of all persons furnishing the contractor "with material and labor in the course of the performance of said work" is enforceable by persons supplying feed for the mules and the coal, gasoline and oil used by the contractor to perform the contract, and a surety on such a bond by a grading contractor is liable for the price or value of animal food sold to the contractor and used by him as food for animals used in doing the work. Maryland Casualty Co. v. Gottsche, C.C.A., 5th circuit, 18 Fed. (2nd) 582.

TIME FOR ACTION ON CONTRACTOR'S BOND

The condition in a contractor's bond for faithful performance requiring action thereon within a specifield time is a condition precedent to action on the bond, and compliance therewith must be alleged or facts and circumstances constituting waiver. Town of Potsdam v. Aetna Casualty & Surety Co., 218 App. Div. 27, 217 N. Y. Supp. 641.

NEGLIGENCE OF STATE IN REPAIRING ROAD NOT SHOWN

Where the state was repairing a road diligently and with an adequate force of men, it could not be considered negligent and liable to an automobilist because it did not employ enough men to repair all its highways in a few days or weeks after the season opened. Moffett v. State, New York Court of Claims, 128 Misc. 156, 217 N. Y. Supp. 825.

LIABILITY OF SURETY ON COUNTER INDEMNITY BOND

Money advanced to a contractor by the surety on a counter indemnity bond given to protect the surety on the bond given for the performance of the contract did not release the surety on the counter indemnity bond from liability thereon unless the payment was made with the agreement, express or implied, of the surety on the contractor's bond that the money paid should be in relief of the indemnity obligation. Eyre v. Fidelity & Deposit Co., C.C.A., 3rd circuit, 13 Fed. (2nd) 464.

LOSS OF PROFITS FROM REPUDIATION OF CONSTRUCTION CONTRACT

Neither party to a construction contract can maintain an action against the other party for loss of profits caused by a repudiation of the contract before the time for performance had arrived unless he pleads and proves that he would have been ready and willing to have performed the contract if the repudiation had not occurred. If a contractor who agreed to furnish labor or materials would not have been able to perform his part of the contract, he suffers no injury in loss of profits because the other contracting party refused to proceed with the contract. Petersen v. Wellsville City, C.C.A., 8th circuit, 14 Fed. (2nd) 38.

ABANDONMENT OF CONTRACT FOR FAILURE TO MAKE CONTRACT PAYMENTS

Where, under a contract, labor is to be performed and materials furnished by a contractor over a considerable period of time, involving large expenditures on his part, and payments are to be made through such period, as the work progresses, the covenant of the contractor to perform the work is dependent upon that of the other party to make the payments substantially at the times specified in the contract, and, in the absence of other provisions or circumstances excusing it, failure to pay an installment when due will justify the contractor in refusing to complete the work.

But a road contractor could not abandon his contract for failure of the county to pay a certain estimate when at the time he had actually received more than he was entitled to demand in any event.

Payments to the contractor in advance of the time specified in the contract would not discharge a bonding company which had guaranteed performance unless it was shown the bonding company had suffered injury therefrom. Pickens County v. National Surety Co., C.C.A., 4th circuit, 13 Fed. (2nd) 758.

MODIFICATION OF DISTRICT ENGINEER'S CONTRACT

The modification of a contract by district engineers to do engineering work on road construction by the substitution of a different rate of compensation and a penalty payable to the engineers for unreasonable delay in letting and doing the work was held supported by a valid consideration. A statutory bond given under the first contract, treated by the parties as being in force under the second, did not require to be re-executed. Jonesboro-Nettleton Road Improvement Dist. v. Klyce, C.C.A., 8th circuit, 15 Fed. (2nd) 918.

FEDERAL COURT'S JURISDICTION OF HIGHWAY CONTRACTOR'S ACTION AGAINST STATE

The Wyoming federal district court holds that an action by a highway contractor against the state highway commission for extra expense incurred in the performance of the contract caused by the engineer's change in the plans and specifications is an action on the contract and not on quantum meruit. Such an action is in effect one against the state, of which the federal court has no jurisdiction where no federal question is involved, and the only ground of jurisdiction relied on is diversity of citizenship, a state not being a citizen. Utah Const. Co. v. State Highway Commission, 16 Fed. (2nd) 322.

DATE OF FINAL SETTLEMENT OF PUBLIC WORKS CONTRACTOR'S ACCOUNT

The "Final settlement" of a public works contractor's account, is the final administrative determination by the proper authority of the amount due, in determining when an action may be brought by a subcontractor on the contractor's bond. Antrim Lumber Co. v. Hannan, C.C.A., 8th circuit, 18 Fed. (2nd) 548.

A subcontractor suing on such a bond more than twelve months after the date of final settlement was held to have shown no sufficient reason for not bringing action within the statutory period, if any such reason ever could exist, as to which the court offered no opinion. United States v. Newport Shipbuilding Corporation, C.C.A., 4th circuit, 18 Fed. (2nd) 556.

NEWS OF THE SOCIETIES

Sept. 13-15—INTERNATIONAL CITY MANAGERS ASS'N. Fourteenth Annual Convention at Dubuque, Ia.

Sept. 13-16—NEW ENGLAND WATER WORKS ASSOCIATION. Annual convention, Boston, Mass.

Sept. 15-16—CENTRAL STATES SECTION, AM. WATER WORKS ASS'N. Annual meeting at Akron, O.

Sept. 27-29 — CANADIAN GOOD ROADS ASSOCIATION. Fourth annual convention at Niagara Falls, Ontario.

Sept. 26-Oct. 1 — SAFETY CONGRESS, Sixteenth annual convention at Hotel Stevens, Chicago, Ill.

Sept. 28-30—NEW YORK STATE SANITARY OFFICERS ASSOCIATION. Annual meeting at Saratoga Springs, N. Y.

October 3—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS: Annual meeting at Denver, Colo.

Oct. 5-8—CALIFORNIA SECTION, AM. WATER WORKS ASS'N. Meeting at San Jose.

Oct. 10-12—SOUTH WEST WATER WORKS ASS'N. Meeting at Hot Springs Ark.

Oct. 12-14—AM. SOCIETY OF CIVIL ENGINEERS. Fall meeting at Columbus, O.

Oct. 17-21—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual convention at Columbus, O.

Nov. 7-9—NORTH CAROLINA SECTION, AMERICAN WATER WORKS ASSOCIATION. Meeting at Durham, N. C.

Nov. 14-18—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Thirty-third annual convention at Dallas, Tex.

Nov. 28-Dec. 2—ASPHALT PAVING CONFERENCE. Sixth annual conference at Atlanta, Ga.

Dec. 1-2—HIGHWAY RESEARCH BOARD, NAT'L. RESEARCH COUNCIL. Annual meeting at Washington, D. C.

Dec. 7-8—NATIONAL RIVERS AND HARBORS CONGRESS. Annual convention at Washington, D. C.

Jan. 9-10—INTERNATIONAL ASSOCIATION OF STREET SANITATION OFFICIALS. Annual convention at Detroit, Mich.

Jan. 9-14—AMERICAN ROAD BUILDERS' ASSOCIATION. Annual convention and road show at Cleveland, O.

Jan. 19-21—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting at New York City.

IOWA SECTION, AMERICAN WATER WORKS ASSOCIATION

The next meeting of the Iowa Section of the American Water Works Association, which section includes Iowa, Missouri, Nebraska and South Dakota, will be held at the Hotel Chieftain, Council Bluffs, Ia., September 28, 29 and 30. J. Chris Jensen, of the Board of Trustees of the Council Bluff Water Works, will be in charge of the local arrangements. A feature of the meeting will be a discussion of the topics of the manual which the Standardization Council of the A. W. W. A. hopes to revise next year.

Arrangements are being made to provide facilities for exhibitors. Requests for space should be sent to Mr. Jensen. Officers of the section are: J. W. McEvoy, Supt. of Water Works, Dubuque, Ia., chairman; Thomas J. S. Skinker, City Water Department, St. Louis, Mo., vice-chairman; W. Scott Johnson, State Sanitary Engineer, Jefferson City, Mo., and John W. Pray, Superintendent of Water Works, Fort Dodge, Ia., directors; Jack J. Hinman, Jr., University of Iowa, Iowa City, Ia., secretary-treasurer.

CENTRAL STATES SECTION, A. W. W. A.

The annual meeting of the Central States Section of the American Water Works Association, will be held at Akron, Ohio, September 15th and 16th, 1927. E. E. Bankson, Union Bank Bldg., Pittsburgh, Pa., is secretary.

NEW ENGLAND WATER WORKS ASSOCIATION

The forty-sixth annual convention of the New England Water Works Association will be held at Boston, Mass., September 13 to 16, inclusive, with headquarters at the Hotel Statler. The following tentative program has been prepared:

Tuesday, 10 *a. m.* Address by Hon. Alvan T. Fuller, governor of Massachusetts; Hon. Malcolm E. Nichols, mayor of Boston; Hon. Edward W. Quinn, mayor of Cambridge.

Reports of Committees on "Standardization of Cast Iron Pipe and Special Castings," Frank A. McInnes, chairman; "Simplification of Manhole Frames and Covers," Frank A. McInnes, chairman; "Specifications for Cast Iron Pipe and Special Castings," Frank A. McInnes, chairman; "System of Sanitary Scoring of Water Supplies," E. Sherman Chase, chairman; "Painting Standpipes," A. O. Doane, chairman; "Yields of Catchment Areas," X. H. Goodnough, chairman; "Effect of Cement Lined Pipe on Quality of Water," Robert Spurr Weston, chairman; "Use of Thermit Heat Units on Frozen Hydrants, etc.," P. R. Sanders, chairman; "Standardization of Pipe Flanges and Fittings," Frank A. McInnes, chairman; "Code for Pressure Piping, Sectional," Malcolm Pirnie, chairman; "Award of Dexter Brackett Memorial Medal," Raymond C. Allen, chairman; "Standardizing the Steps of the Meter Schedule," Arthur E. Blackmer; "Legislative Committee," Charles W. Sherman, chairman; "To Investigate the Grounding of Currents on House Plumbing to Act in Connection with a Similar Committee of the American Water Works Association," George A. Sampson, chairman; "Representative at Tests of the Bureau of Standards," Harry W. Clark; Finance Committee, Samuel E. Killam, chairman; Program Committee, Arthur D. Weston; Quarters Committee, Robert Spurr Weston.

Tuesday, 2 *p. m.* "Cross Connections in Connecticut," by Warren J. Scott. "Report of Committee on Cross Connections," by Robert Spurr Weston. "Leaks and Litigation," by George H. Finneran.

Tuesday, 8 *p. m.* "Fire Prevention Engineering," by Charles W. Morey. "Field Engineering Service of the National Fire Protection Association," by Franklin H. Wentworth.

Wednesday, 9 *a. m.* "Reliability Features of Electrically Operated Pumping Equipment," by R. C. Dennett. "Five Years' Operation of Boston High Pressure Water System," by E. E. Williamson. 11.20 *a. m.* Demonstration by Boston Fire Department of high pressure system and fireboats at Atlantic and Northern avenues.

Wednesday, 2 *p. m.* "Montreal Typhoid Epidemic," by M. Aime Cousineau. "Interstate Water Rights," by Caleb M. Saville. "Public Works and State Boundaries," by Clemens Herschel. "What Every Engineer and Water Works Superintendent Should Know About Chlorination," by R. V. Donnelly.

Wednesday, 8 *p. m., Main Conference.* "Amesbury Iron Removal Plant," by R. S. Weston. "Sand Embankment Impounding Dam, City of Chicopee," by Myron G. Mansfield. "Municipal Water and Sewerage Costs in State of Maryland," by Abel Wolman.

Special Superintendents' Conference, Stephen H. Taylor, chairman. Subjects:

Water Works Accounting—Ledger tems; Billing; Deposits; Consumers' contracts and bonds; Operation of lien law; Permanent records of mains, valves and hydrant locations; Water works assessments.

Maintenance—Street locations of mains (two mains on wide streets); Practice of providing service lines to vacant lots; Season and time to do of flushing mains; Inspection of fire hydrants; Extension of dead ends beyond fire hydrants; Location of fire hydrants on private property; Painting hydrants; Inspection of valves; Kind of pipe used for services, and why; Life of various kinds of services; Method used in determining size and type of meter required.

Thursday, 9 *a. m.* "Distribution Pumping Stations of the Metropolitan Water Works," by A. O. Doane. "The Water Supply of Caracas, Venezuela," by Thorndike Saville. "Standpipe at Charleston, S. C.," by J. B. Gibson. "Five Years' Operation of Cambridge Water Works Filtration Plant," by Prof. Melvin C. Whipple. "One Year's Operation of the Providence Filtration Plant," by Julius W. Bugbee.

Thursday, 2.30 *p. m.* Inspection trips. Autos leave Hotel Statler at 2 p. m. for Cambridge Filter Plant, guests of the City of Cambridge; and for Hersey Meter Plant, guests of Hersey Mfg. Co.

Thursday, 8.30 *p. m.* Dinner dance at Hotel Statler for members and guests, courtesy Water Works Manufacturers' Association.

Friday, 9 *a. m.* "Water Supplies in New York State and Laws Relating Thereto," by C. A. Holmquist. "Clarification of the Catskill Water Supply of the City of New York by Coagulation and Sedimentation," by William W. Brush. Award of Mayor Malcolm E. Nichols Trophy for member coming from the longest distance. Report of tellers of election. President's address.

Friday, 2 *p. m.* Sail down Boston harbor for members and guests, with shore dinner and dancing at Hotel Pemberton, Hull, courtesy Water Works Manufacturers' Association.

The following members of the Water Works Manufacturers Association have signified their intention of exhibiting at this convention:

American Brass Co., Builders Iron Foundry, A. M. Byers Co., the Central Foundry Company, Edson Mfg. Co., Federal Meter Corp., W. & L. E. Gurley, Hersey Mfg. Co., Kennedy Valve Co., Lead Lined Iron Pipe Co., Leadite Company, Lead Hydro-Tite Co., La Motte Chemical Products Co., Mueller Co., National Meter Co., Neptune Meter Co., Pitometer Co., Pittsburgh Equitable Meter Co., Pittsburgh-Des Moines Co., Paradon Engineering Co., Ross Valve Mfg. Co., Red Hed Mfg. Co., A. P. Smith Mfg. Co., Geo. H. Snell Co., W. P. Taylor Co., Thompson Meter Corp., Union Water Meter Co., U. S. Cast Iron Pipe Co., Wallace & Tiernan Co., Inc., Water Works Equipment Co., R. D. Wood & Co., Worthington Pump & Mach. Co., Badger Meter Mfg. Co., Barber-Greene Co., Chapman Valve Co., Geo. A. Caldwell Co., Cement Lined Pipe Co., Eddy Valve Co., Edson Mfg. Co., Giant Mfg. Co., Lock Joint Pipe Co., McWane Cast Iron Pipe Co., National Water Main Cleaning Co.

NATIONAL CONSTRUCTION EXPOSITION

The Associated General Contractors of America, representing 2,300 general contracting firms, with headquarters in 40 different states, will hold a National Construction Exposition in the West Baden Springs Hotel, West Baden, Indiana, January 23-27, 1928. Every important method used throughout the general construction industries will be shown in a series of exhibits which will demonstrate all types of construction materials, supplies and accessories for industrial, engineering, governmental, transportation and specialty building projects. There will be practically no general public attendance.

Exhibits will be prepared by many of the leading construction material and supply companies of the country. First, second and third awards will be made by the Associated General Contractors of America, through a special committee, to the companies having displays adjudged the most effective.

The exposition will be held in conjunction with the ninth annual meeting of the association, and is a response to requests by a large number of important materials and supplies companies for adequate and officially recognized construction display facilities.

The show will open officially at 9:30 a.m. daily. Official evening closing hours will vary in accordance with the entertainment program of the Association. Installation of displays will begin Friday, January 20. Dismantling will take place at a sufficiently early hour to allow exhibitors' representatives to leave late Friday evening, January 27th.

The general office of the exposition is at 225 West 34th Street, New York City.

COUNTY HIGHWAY OFFICIALS' DIVISION, AMERICAN ROAD BUILDERS' ASSOCIATION

On July 25th the executive committee of the newly organized County Highway Officials' Division of the American Road Builders' Association held its first meeting in the office of President Wasser, Jersey City, N. J.; and in addition to formulating by-laws to be presented to the board of directors at its next meeting, mapped out a program for the ensuing year.

A part of the plan of organization is to have county contact men, or a representative of the division appointed from each county who would serve as the contact between the division and the county and who would be the official delegate to the annual convention. New Jersey was the first state to complete the appointment of all its contact men. In some states there is already a county organization, but where there is no such organization it was urged that the contact men of the same state should organize into state units.

In addition to the consideration of the appointment of county contact men, several standards committees were created and chairmen appointed. Eight committees were appointed; other committees will be added from time to time. The committees and their chairmen are as follows:

1. Committee on Surveys and Planning, Chairman, Stanley Abel;
2. Committee on County Highway Construction, Chairman, Chas. E. Grubb;
3. Committee on Rural County Highway Maintenance, Chairman, E. B. Wilkes;
4. Committee on Urban County Highway Maintenance, Chairman, Geo. A. Quinlan;
5. Committee on County Highway Legislation, Chairman, H. B. Keasbey;
6. Committee on County Administration, Chairman, Chas. A. Browne;
7. Committee on Construction and Mainenance Equipment, Chairman, E. L. Gates;
8. Commttee on County Highway Finance, Chairman, John McHugh.

The reports of the committees will form the basis of a paper that is to be presented by the chairman, or by someone appointed to represent the committee, on County Highway Officials' Day at the Convention and Road Show of the American Road Builders' Association next January, on which day all activities will be handled by county officials and the program will be made for their benefit.

There will be a meeting of all committees Monday, January 9th, at the Hollenden Hotel, Cleveland, for the purpose of making addenda to the reports and for formulating plans for the next year.

ROAD BUILDERS COMBAT HIGHWAY ACCIDENTS

The American Road Builders' Association will make a direct appeal to 30,000 churches in the United States to launch a campaign in behalf of Highway Safety during the month of October, and in addition will carry the safety movement into all schools, civic clubs and motorist organizations of the United States.

The campaign to be launched by the association will be the most intensive ever carried out in the United States. The 700,000 casualties occurring each year on streets and highways are considered to be far in excess of the number that should result from natural traffic hazards.

A national Highway Safety Club will be organized as a vehicle for the spread of constructive highway safety information. Every citizen of the United States will be asked to become a member of this club and to cooperate in an effort to reduce the loss of life on the public streets and highways. Membership in the club will be without charge and will be granted to all persons signing a pledge to practice reasonable caution and courtesy while on the streets and highways.

A feature of the campaign will be the elimination of the usual list of confusing safety rules and the substitution of the simple ethics of courtesy and caution. The individual alone is responsible for highway accidents. The American Road Builders' Association will make its appeal directly to each individual citizen rather than to the masses.

The results of the campaign will be reported during the annual convention of the association at Cleveland on January 9th.

WESTERN SOCIETY OF ENGINEERS

A feature of the meeting of the Western Society of Engineers, which was held at Chicago, Ill., Aug. 17, was an inspection trip to Buffington Harbor, the new deep water harbor of the Universal Portland Cement Co. Officers of the society for 1927-28, are: President, Major Rufus W. Putnam; first vice-president, John A. Garcia; second vice-president, William S. Monroe; third vice-president D. J. Brumley; treasurer, George W. Hand; trustees, Frank D. Chase, E. P. Rich and C. C. Whittier.

SIXTH ANNUAL ASPHALT PAVING CONFERENCE AT ATLANTA

Remarkable progress by the southern states and cities in improved highway and street construction during the past five years will be emphasized at the Sixth Annual Asphalt Paving Conference to be held at Atlanta, Georgia, during the week of November 28. The sessions will cover paving research, highway engineering, contracting, manufacturers' problems and the economics involved in the vast outlay for streets and highways, and particularly the conservation of existing pavements. The conference will be held under the joint auspices of The Asphalt Association, of which J. S. Helm, Standard Oil Company of New Jersey, is president, and the Association of Asphalt Paving Technologists of which Hugh W. Skidmore, president of the Chicago Paving Laboratory, is president.

National committees in charge of the various features of the conference are headed by John Klorer, Commissioner of Public Property, New Orleans, for the Engineering Section; W. A. Hansell, Chief, Department of Construction, Atlanta, as chairman of the Local Committee; L. B. West, of the West Construction Co., Chattanooga, Tenn., for the Contractors' Section, and Francis P. Smith of New York, consulting engineer, for the Research Section. Members of the committees include J. N. Mackall, State Highway Commissioner of Maryland; Geo. H. Henderson, State Highway

(*Continued on page* 40)

NEW CATALOGS

Chicago Automatic Conveyor Co., Chicago, Ill. Bulletin No. 64, 4-page illustrated folder describing Model BT-14, belt-type conveyor; Bulletin No. 65, 8-page illustrated pamphlet, describing Model HBW heavy-duty belt-type conveyor.

Ingersoll-Rand Co., N. Y., 8-page illustrated pamphlet, describing Ingersoll-Rand equipment.

Sweet's Steel Co., Williamsport, Pa., 8-page elaborately illustrated booklet, describing "Herculean" channels and steel parts, with especial reference to steel posts for highway markers and fences.

General Electric Co., Schenectady, N. Y. An 8-page illustrated booklet, describing General Electric gas-electric drive for trucks and buses.

Root Spring Scraper Co., Kalamazoo, Mich. A 4-page illustrated folder, describing the Root reversible spring scraper, which is especially adapted to road maintenance work.

Koehring Co., Milwaukee, Wis., Illustrated folder describing features of the Koehring Shovel.

American Gas Accumulator Co., Traffic Engineering Division, Elizabeth, N. J. An 8-page illustrated catalog showing a complete line of traffic signals and reflector signs.

Galion Iron Works and Mfg. Co., Galion, O. An 8-page illustrated catalog describing Galion Fordson E-Z Lift Motor Graders.

Galion Iron Works and Mfg. Co., Galion, O. A 16-page illustrated catalog describing Galion Leaning Wheel E-Z Lift Graders.

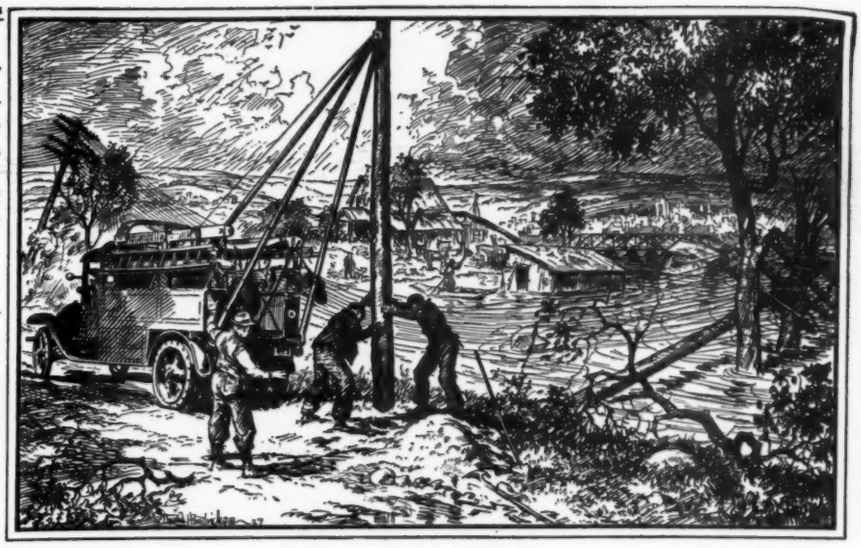
Celite Products Co., Los Angeles, Calif. Bulletin 325-B. 16 pp. Ill. Gives up-to-date information on the use of Celite in concrete, including data of general interest.

Link-Belt Co., Chicago, Ill. A 44-page illustrated booklet describing typical elevators applicable to average conditions of handling nearly all materials in bulk.

The Dorr Co., N. Y. An 8-page illustrated bulletin describing the Dorrco self cleaning bar screen.

The Dorr Co., New York. A 4-page illustrated pamphlet describing the Dorr traction clarifier.

Marion Steam Shovel Co., Marion, Ohio. An illustrated folder describing the Marion Type 7 gas-driven shovel, dragline and crane.



All for One

An Advertisement of the American Telephone and Telegraph Company

A SLEET storm descends, carrying down trees and wires. A wind turns outlaw and blows down a pole line. Or some swollen river rampages through a circuit of destruction.

But wherever angry nature attacks the Bell Telephone System there are repairmen trained to meet the emergency, and everywhere trained in the same schools to the use of the same efficient tools. Supplies of surplus equipment and materials are kept at strategic points whence they may be rushed by train or truck to the devastated area.

Throughout the Bell System, all construction and practice are standard, so that men and supplies, when necessary, may be sent from one state or company to another.

There are twenty-five Bell Companies, but only one Bell System—and but one Bell aim and ideal; stated by President Walter S. Gifford as:

"A telephone service for this nation, so far as humanly possible free from imperfections, errors and delays, and enabling anyone anywhere at any time to pick up a telephone and talk to anyone else anywhere else in this country, clearly, quickly and at a reasonable cost."

H. W. Clark Co., Mattoon, Ill., Catalog No. 27, 64 pages. Illustrated. Describes the line of Clark waterworks equipment.

R. H. Beaumont Co., Philadelphia, Pa. Catalog No. 95. 32 pages. Illustrated. Describes the Beaumont cable drag scraper for gravel, sand, stone, and other bulk materials.

Novo Engine Co., Lansing, Mich. Novo Hoisting Handbook. 44 pages. Illustrated. Contains valuable information about hoists and hoisting work.

Speeder Machinery Corp., Cedar Rapids, Ia. A 32-page illustrated catalog describing the Speeder ½-yard convertible shovel.

Lock Joint Pipe Co., Ampere, N. J. An illustrated folder describing Washington, D. C. installations of Lock Joint Pipe.

Link-Belt Co., Chicago, Ill. A 16-page illustrated bulletin (No. B-10) describing the Link-Belt crawler shovels, and giving dimensions and specifications

Engineer of Rhode Island; Jay Downer, Chief Engineer of the Westchester County (N. Y.) Park Commission; John B. Hittell, Chief Paving Engineer of Chicago; W. W. Horner, Chief Engineer of Sewers and Streets, St. Louis; C. A. Mullen, Secretary of the Association of Asphalt Paving Technologists, Montreal, Canada; W. J. Emmons, Research Specialist of the U. S. Bureau of Public Roads; A. K. Vickery, City Engineer, Denver, Colo.; George F. Fisk, First Assistant City Engineer, Buffalo.

The most economical and effective methods of surfacing gravel and macadam roads, of which most of the states have a considerable mileage, will be given emphasis in the discussions. Stage construction of highways, involving completion in a period of years, will also be compared to the method of making larger immediate outlays for complete construction. Model county construction and management will be presented by representatives of the counties in the different sections of the country which have been successful to an outstanding degree in acquiring and maintaining efficient highway systems at low cost. Among the most successful counties in this respect are Burlington County, N. J.; Harrison County, Miss.; Caddo Parish, La., and Muscogee County, Ga. Efforts will be made at the conference sessions to simplify specifications, tests and designs, and eliminate a considerable portion of the confusion now prevailing in the requirements of states, counties and cities. Of particular interest to farming communities and railroads will be the subject of radial highway development versus through trunk lines as affecting the needs of farming communities and the shipment of local products from rail points.

PERSONALS

Scotland G. Highland, for 21 years prior to last May, secretary and manager of the Clarksburg, W. Va., water works, has been reappointed to that position.

George M. Shepard, for five years chief engineer of the Dept. of Public Works of St. Paul, Minn., has resigned and on August 1 became chief engineer for the Northern State Contracting Co., of St. Paul.

Bert C. Wells, for the past six years city manager of Atchison, Kans., and for four years of El Dorado, has been appointed city manager of Wichita, of which place he was city engineer prior to ten years ago.

A. W. Seng, formerly city manager of Hays, Kans., has been appointed city manager of Atchison.

E. D. Fry, formerly resident engineer for Solomon, Norcross & Keis at Fort Lauderdale, Fla., is now engineer of the Greater Greenville Sewer District Commission at Greenville, S. C.

F. W. Hartmann, formerly city engineer at Iron Mountain, Mich., is now city engineer at Alma, Mich.

P. F. Hopkins, for the past seven years city manager of Ames, Ia., on June 1 became city manager of Mason City, Ia.

Verney W. Russell, formerly office engineer of the Bureau of Reclamation, has been appointed division engineer in charge of construction on the Yakima Project of the Bureau, with headquarters at South Cle Elum, Wash.

Sidney S. Anthony, recently employed on the construction of the Scituate tunnel at Providence, R. I., has been appointed superintendent of the Augusta, Me., Water District.

Arthur H. Blanchard, formerly professor of highway engineering and highway transport at the University of Michigan, has resigned and will open an office as consulting engineer at Toledo, O.

John W. Kelsey, formerly superintendent and engineer of the St. Paul Water Works, has been appointed chief engineer of the Dept. of Public Works of that city.

MUNICIPAL AND OTHER PUBLIC REPORTS

Bureau of Sewage Disposal, Schenectady, N. Y. Twelfth Annual Report covering the year 1926. 17 pp.

Report of the Sewage Substation of the New Jersey Agricultural Experiment Station for 1926. By Willem Rudolfs. This report of the 1926 work contains a paper on "The Effect of Lime on Sludge Digestion," including the details of laboratory experiments, work on Imhoff tanks and separate sludge digestion tanks, and the amounts of lime necessary to meet varying conditions in the adjustment of fresh solids and material in digestion tanks. Other studies reported sprinkling filter beds, and on the distribution and succession of protozoa in Imhoff are in regard to film accumulation in tanks.

Measurements of Flow of Colorado River.—The Geological Survey of the Department of the Interior has just issued one of its series of annual water supply reports giving the results of stream measurements in the Colorado river basin. In cooperation with various States and other organizations interested in the flow of the Colorado, the Geological Survey maintained during the year ending September 30, 1923, some 80 stream-gaging stations, at most of which were obtained records of daily flow of the river and its tributaries, covering a great drainage basin of some 242,000 square miles.

The first table in the report gives the flow of the Colorado at a point way up in northern Colorado, where the river is a tiny stream with a flow at times of less than 100 cubic feet a second. During the summer flood, which resulted chiefly from melting snow in the high altitudes of the headwater streams, the flow in the Grand Canyon and downward to the mouth was over 100,000 cubic feet a second.

The Colorado river report is largley statistical and covers 175 pages. It may be purchased from the Superintendent of Documents, Washington, D. C., for 25 cents. Ask for Water-Supply Paper 569.

BOOK REVIEWS

Highway Bridge Location. By C. B. McCullough, Bridge Engineer, Oregon State Highway Commission. Published by the Department of Agriculture. 32pp. Ill.

This bulletin, which is the result of cooperative work between the Bureau of Public Roads and the Oregon State Highway Commission, presents in a clear manner the many points to be considered in bridge location. It stresses the thorough investigation of the bridge site. Among the more important matters discussed are: Location of minor structures; cost considerations involved in the location of large structures, including length and angle of crossing, foundation conditions, and channel permanency; maintenance considerations, such as scour; alinement; grade-line treatment; traffic influence; and location over navigable waters.

The History of the Incandescent Lamp. By John W. Howell and Henry Schroeder. 208 pp. Ill. The Maqua Co., Schenectady.

This interesting book traces the development of the incandescent lamp from its earliest beginnings; it also outlines briefly the development of the knowledge of electricity. Edison's researches and his success in solving the many problems of the lighting industry are interestingly described, as is the evolution of the incandescent lamp to its present stage.

CIVIL SERVICE EXAMINATIONS

Engineering Aid—Applications until Sept. 13, to fill vacancies with Interstate Commerce Commission. Salary, $1,680. Duties are to assist in assembling engineering reports and to perform computations and routine office work.

Junior Metallurgist—Application to Sept. 17. Salary, $1,860. Duties include testing and research work, and general metallurgical work.

Junior Examiner, U. S. Patent Office—Applications to Sept. 17. Salary, $1,680. Three years of technical college work, or 2 years of college and practical experience are required.

TRADE PUBLICATIONS

Curing Concrete Roads, Streets and Bases with Grasselli Silicate of Soda. Ill. 22 pp. The Grasselli Chemical Co., Cleveland, O. The use of silicate of soda, the familiar "water-glass," as a curing agent for concrete, is described, and specifications and practice in a number of places is given. Considerable economy over other methods of curing is claimed, and costs are given.

Link-Belt Sykes Herringbone Speed Reducer. Book No. 715, Link Belt Co., Philadelphia, Pa. A 16-page illustrated

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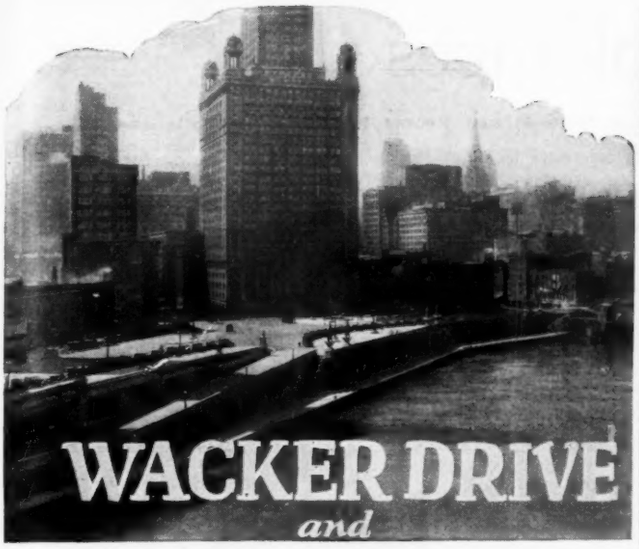


SEALTIGHT

THE PERFECTED JOINT

Wacker Drive, Chicago's new "double-decked" boulevard, represents an investment of millions of dollars. Such a valuable civic improvement deserves the best possible protection against the destructive forces of nature. That's why Sealtight Expansion Joints were used on this magnificent boulevard.

Sealtight is a mixture of pure blown petroleum asphalt and a long flexible fibre filler which upon oozing seals the joint perfectly. Sealtight does not need reinforced sides to make it easily handled—the special quality fibre filler reinforces it throughout.

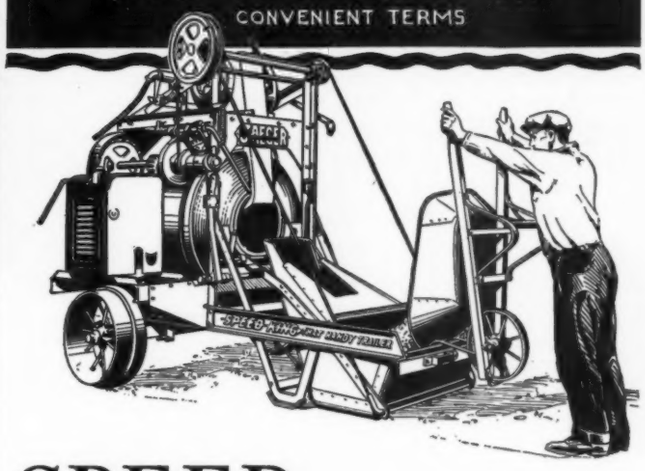
Make the Road Right—
Use "Sealtight"

W. R. MEADOWS, Inc.

ELGIN **ILLINOIS**

JAEGER *Announces*

A FASTER 7S MIXER
THE ~~SPEED KING~~
$200 PRICE REDUCTION
CONVENIENT TERMS



SPEED

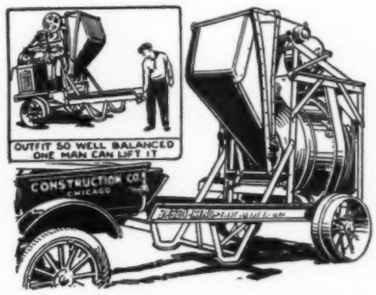
More Batches Per Day

Faster discharge—fast charging without pounding using "Skip Shaker"—fast accurate measure water tank.

END DISCHARGE—Will do anything a side Discharge type will and in addition save labor and wheeling by pouring floors, walks, curbs, alleys or into forms. (Use like a Paver).

STURDIER—100% Roller bearings—steel construction cuts weight 500 lbs., adds 50% strength. More compact. A full one bag mixer.

LOW CHARGER



PORTABILITY TRAIL IT ANYWHERE

MORE PORTABLE—Trail it anywhere at high speeds—roller bearing wheels—spring shock absorbers — easy to handle, so well balanced that one man can pick up outfit like a wheelbarrow.

Jaeger Mixers furnished in all sizes 3½ ft. to 28 ft. Tilting or non-Tilt types. Write for Complete Catalog—Prices—Easy Terms.

THE JAEGER MACHINE COMPANY

400 Dublin Ave. **Columbus, Ohio**

SEND THIS SLIP TODAY FOR NEW PRICE

THE JAEGER MACHINE CO., 400 Dublin Ave., Columbus, O., AD 78

Date.....

Name .....

Address .....

City ..... State.....

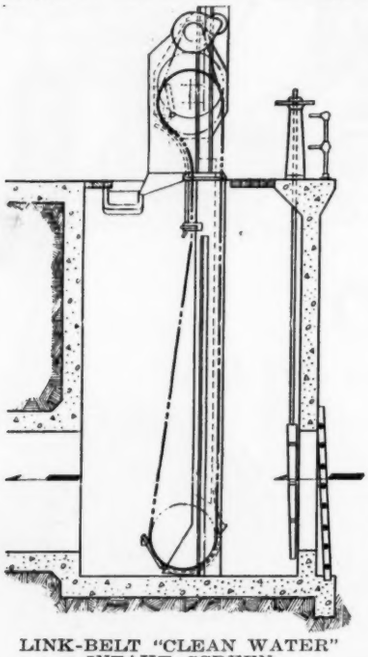
☐ Non-Tilter (7–10–14–28 ft.) ☐ Plaster Mixer Check size wanted. ☐ Tilter (3½–5–7–10–14 ft.)

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

LINK-BELT "CLEAN WATER" INTAKE SCREENS

The Link-Belt Co., Chicago, Ill., manufactures "Clean Water" traveling intake screens which it claims assure a constant supply of trash-free water, with a minimum loss of head. Screen openings are kept clean at all times from slush, needle ice and trash. The use of these screens eliminates practically all manual labor in cleaning screens and disposing of trash, since water sprays automatically clean the trays and discharge the trash into the gutter. Skilled labor is not required,



LINK-BELT "CLEAN WATER" INTAKE SCREEN

since the screens are easy to operate; only a small amount of power is needed, and ordinarily the screens need be operated only for short periods. Continuous operation is required during flood conditions, when streams are filled with leaves, or when needle ice is present. Each screen is separately driven, which permits the operation of one or more screens to suit conditions.

WAGNER PIPE CUTTER

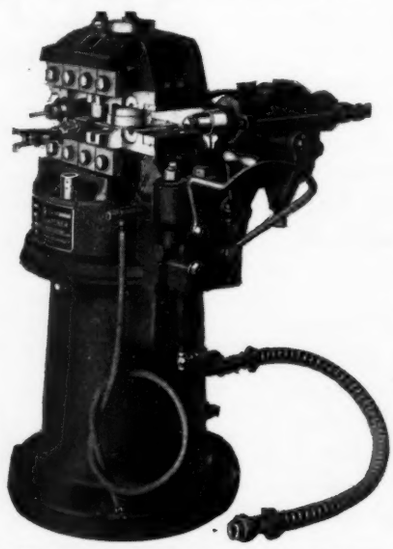
The Oxweld Acetylene Co, New York, N. Y., handles the Wagner pipe cutter, which is a most compact and simple machine. It consists of two gears and a framework so arranged that two Oxweld oxy-acetylene cutting blow-pipes are carried around the circumference of the pipe during cutting. When the crank handle is turned, the gears revolve the carriage which supports the two blow-pipes. The blow-pipes may be adjusted to any angle of cut, though 45 deg. is the usual angle. Distance between cuts may be varied within reasonable limits. The unit is exceedingly compact, reducing the amount of bell hole digging. By using different sized internal shoes, the machine in the smaller size will cut 4, 6, and 8-inch pipe; a large size cuts 10, 12, and 14-inch pipe.

The machine was invented by N. E. Wagner, welding superintendent of the Prairie Pipe Line Co., Tulsa, Okla.

NEW LEYNER DRILL STEEL SHARPENER

The Ingersoll-Rand Co., New York, has brought out a new sharpener, the No. 34, which is especially suited for use on small jobs. The No. 34 Sharpener will make (1) all standard bits up to 2½" gauge, and (2) standard shanks on steel of 1" diameter. In addition, it will form moil points and paving breaker shanks on 1⅛" solid hexagon steel; do upsetting and bending; and take care of the forming and forging operations in making bolt and rivet heads, spikes, pins, wedges and hand picks.

The comparatively light weight (1430 pounds) is an aid to moving. The control is very simple. Among the special mechanical features are the following: air receiver in the base, blow-off valves to drain entrapped water, ample former space, adjustable hammer cylinder, bush-



LEYNER DRILL STEEL SHARPENER

ed-type fronthead, automatic lubrication, dolly spring carriage, and single-lever control with improved and more sensitive throttle.

SISALKRAFT

American Reenforced Paper Co., Attleboro, Mass., manufacturers "Sisalkraft," a waterproofed reinforced paper, suitable for building and construction work of many kinds. Sisalkraft consists of two outer sheets of No. 1 Nibroc Kraft, between which are placed two layers of Java sisal fibres, laid lengthwise and crosswise and firmly embedded in two coatings of high grade asphaltum. This construction gives extreme strength. Sisalkraft is especially suited for use as a protective covering for concrete roads while curing, and it is claimed that on this work there is considerable economy over the use of other usual protective materials. Sisalkraft may also be used in place of canvas to protect machinery and equipment; it is suitable for the construction of camps, field offices, garages, and similar buildings. In fact, there are many uses for it on the average construction job.

SIMPLEX TRENCH BRACE FITTING

Templeton, Kenly & Co., Ltd., Chicago, Ill., has recently devised a 3-way nut for use with Simplex trench braces. This 3-way nut, illustrated herewith, is of especial advantage for use in close quarters where the regular lever nut cannot be used conveniently. The nut is made with holes to fit a 1-inch rod. It is furnished without extra charge in place of the regular nut when desired.

NEW TRAFFIC SIGNAL MECHANISM BOXES

The General Electric Company, Schenectady, N. Y., has introduced two new types of traffic signal mechanism, known as forms 52 and 53 Novalux traffic control boxes. These consist of a cast-iron box containing a timer, two snap switches, a fuse block and fire relay. One snap turns the signals on and off; while the other switch, labelled "amber," turns on a flashing amber indication for late evening hours when the flasher is not used as a regulating device. A fire relay mounted on jack plugs is included in the control box so that remote fire control may be obtained. The form 52 control box includes a synchronous motor-driven automatic timer. The use of this control box at each intersection permits the operation of a "follow-the-green light," or progressive control system without any interconnecting cables between in-

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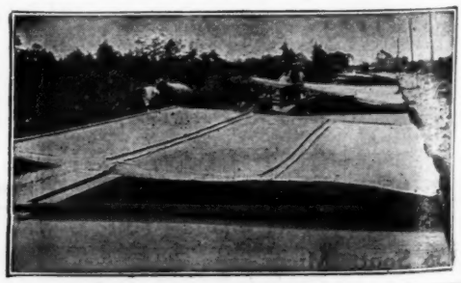


SISALKRAFT ON CONCRETE ROAD

Rolling down crushed stone surface for filling station (a small job)

HUBER
4-CYLINDER MOTOR ROLLERS

No Job Too BIG! No Job Too Small!

Yessir—Huber likes all sorts of jobs—big ones and small ones alike. If you need a versatile roller—one you can depend upon—one you know will put in 8, 10, 12, or 24 hours a day without a whimper—look to Huber. Huber 4-Cylinder Rollers are made in four sizes (5-7-10-12 tons)—built to do a good day's work every day of the year at the most economical operating expense you ever saw. Investigate Huber today—catalog free—write for it.

THE HUBER MFG. CO., 325 E. Center St., MARION, OHIO

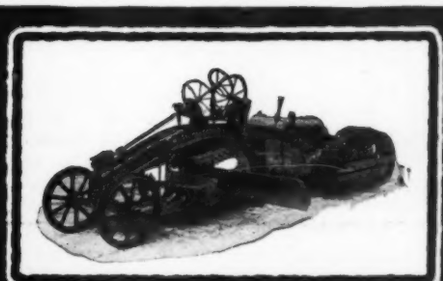
How Fast Can You Cut Concrete?

On a test run in Milwaukee, a Sullivan Buster and a Sullivan Compressor cut concrete three times quicker than hand labor.

The Buster in 7 minutes removed a strip of 3-in. asphalt 15 ft. long by 29 ins. wide; then it dug out the underlying 8-in. reinforced concrete in 16 minutes. The Buster was run by a Sullivan "WK-312" 110-ft. Portable Compressor, and the contractor on the job said the work was done in one-third the time hand labor would have required.

Write for pictorial booklet, "Speed Up With Air."

Sullivan Machinery Company
138 South Michigan Avenue CHICAGO



The Heart of Traffic

Roads are the arteries through which flow the life blood of traffic.

Keep the arteries 100% with H. P. "One Man" Graders. Road quality increased—costs decreased. H. P. Graders scarify, root, grade, ditch, roll and remove snow in winter.

Sturdy, economical, fast and reliable.

Al-wa-tracs crawlerize your tractor and double pulling power.

Al-wa-tracs Do It

Ditches Scarifies Roots Rolls

W. A. RIDDELL CO., *Successors to*
The Hadfield-Penfield Steel Co.
Bucyrus, Ohio

tersections. The form 53 control box includes an automatic timer driven by an induction motor. This type of control is adapted to installation and control of signals at isolated intersections, or for control of centrally-operated cable interconnected control system.

Each of these boxes has a flashing mechanism integral with the automatic timer, which permits the setting of a flashing amber operation of signals during the period of the day when the stop and go operation of signals may be suspended. The housing proper is a small, compact, weatherproof cast-iron box with rounded corners and eaved door, for mounting on a short pedestal or on wooden or metal poles by means of pole clamps.

GALION CLETRAC GRADER.

The Galion Iron Works and Mfg. Co., Galion, O., has announced a new Cletrac Grader, which is a combination of the Galion E-Z lift grader and the Cletrac K-20 tractor.

The assembling of the units is so simple that loosening four attachments and hoisting the rear of the grader makes the Cletrac immediately available for

GALION CLETRAC GRADER

other service. Thus owners of a Cletrac K-20 may have a motor grader complete by purchasing the grader parts only. The Galion features of this motor grader include a powerful scarifier, a new type of spring suspended yoke, a low platform with fenders and cab. Steering, scarifier control and blade lift are all by machine-cut worm gearing operating in a bath of oil in an oil-tight gear case. A feature of value in this combination is the compensating differential and planetary transmission of the Cletrac which causes it to follow the front wheels of the grader as steered by the operator. At the same time the steering mechanism of the tractor is instantly available in difficult situations, giving the operator a powerful extra factor of control when needed.

HIGHLAND ROCKER SILL TRUCK CAB MOUNTING

The Highland Body Mfg. Co., Cincinnati, O., has developed the Highland Rocker Sill mounting for truck cabs. It is stated that, due to better road conditions, lighter trucks with more flexible frames and lighter chasses are being used. On rough roads, the lighter frames allow twisting, as a result of which many cabs fail. The rocker sill mounting contemplates bolting the cab rigidly to the dash, which is stated to be the neutral point when the chassis frame is twisted. The rear of the cab rests on an angle iron, bolted rigidly to the chassis frame. The rear sill of the cab is cut on a circular arc, and the cab is secured to the angle iron with a heavy bolt and spring. The side sills of the cab are not in contact with the side members of the chassis frame, and so allow the frame to twist without putting any strain on it. On cobble streets, the shocks of the chassis frame are not transmitted to the driver's seat, giving more comfort. All Highland cabs are now equipped with this mounting, which has proven very effective in service.

JAEGER 7s "SPEED KING" MIXER.

The Jaeger Machine Co., Columbus, O., has brought out a new, all-steel, one-bag mixer, type 7s. This mixer will stand up under high speed trailing, having springs and roller bearings, with dual wheels. It is an end-discharge type, and is very compact, requiring only 6 feet of street space. The all-steel construction saves weight and increases strength. It is completely equipped with roller bearings, and is stated to be so balanced that one man can handle it easily. It is built in low charger or loader type, with accurate measure water tank. The loader has a patented skip shaker and can be furnished with batch meter, inexpensive traction for moving itself along forms, and swinging spout.

OIL BURNING KETTLE FOR ROAD WORK

Littleford Bros., Cincinnati, Ohio, has recently placed on the market an exclusive oil-burning asphalt melting kettle for road construction work. It is known as Type No. 83, and is made in two capacities, 300 and 550 gallons.

The new kettle embodies practically all of the features of the Littleford "Contractor's Special" wood burning kettle, Type No. 48, except that it is built for burning kerosene or a light furnace oil exclusively. Two oil burners, of Littleford manufacture, supply an intense heat, which the manufacturer claims will melt batches of asphalt in a much shorter time than is possible with a wood or coal fire.

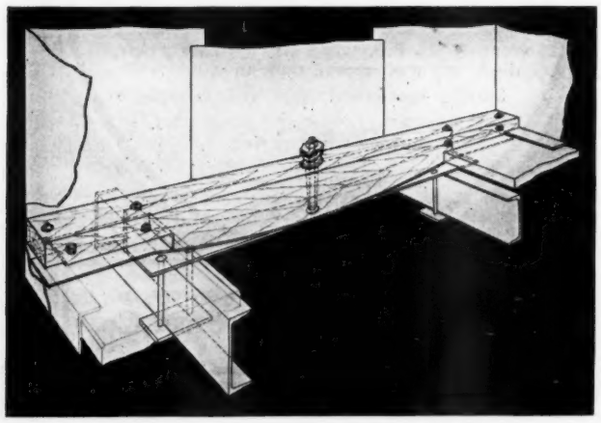
The kettle carries a fuel tank of twenty gallons capacity, and is mounted on roller bearing wheels and high carbon steel axles. While standard equipment includes all-steel wheels, the kettle is mounted on solid rubber tires with steel heat guards, when desired.

LITTLEFORD OIL-BURNING MELTING KETTLE

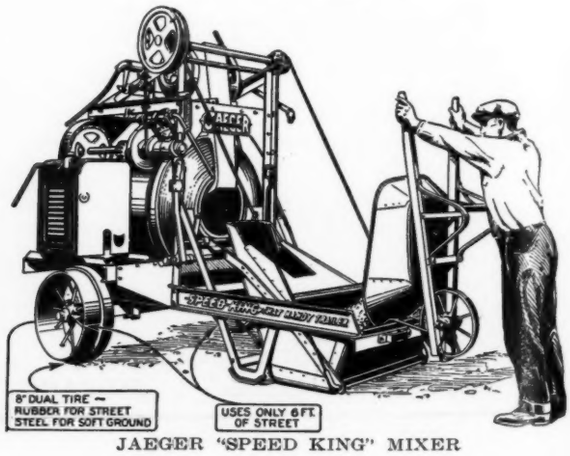
A warming hood to take the place of the standard cover, and a barrel hoist for raising barreled materials, are accessories which can be furnished.

INDIANA MOTOR TRUCK POLE SETTER

The Indiana Truck Corporation, Marion, Ind., manufacturer of the Indiana motor truck, has equipped its Model III., 1½-ton truck, with a special utility body and a pole setter. This device is operated by a special Western Electric winch mounted in the front of the body. The pole setter can be disassembled readily and carried on brackets provided on the sides of the body.



HIGHLAND ROCKER SILL MOUNTING



JAEGER "SPEED KING" MIXER

Tools?—One Wrench!

One wrench, plus one man plus a few minutes and you can have the whole insides of a Darling Fire Hydrant lying on the pavement beside you.

The seats are removed as well as the other parts through the top without the necessity of digging up the hydrant. Darling is a compression type of hydrant, closing with the pressure.

Any water works or fire official knows what an economy this means and it's one of the reasons why more cities, every day, are adopting Darling Hydrants as standard equipment.

DARLING VALVE & MANUFACTURING CO.

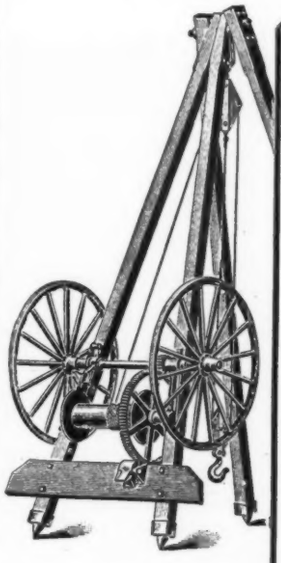
WILLIAMSPORT, PENNA.

New York Chicago Oklahoma City Houston

DARLING FIRE HYDRANTS

POLLARD

PIPE LINE EQUIPMENT



Laying more pipe each day means putting more profits away.

That is exactly what a Pollard Sulky Derrick will do. It saves money.

Built of clear selected spruce.

Mounted on Sarven patent wheels which are used as crank handles to raise or lower the load. The wheels are also used to move the derrick from one job to another.

You should know all about the Pollard Sulky Derrick. Let us tell you why it is a money saver.

Send for our complete catalog on pipe line equipment.

Joseph G. Pollard Co., 146 Raymond St., Bklyn., N.Y.

DIRECT OXIDATION

SEWAGE AND WATER TREATMENT

INQUIRIES INVITED

FROM

ENGINEERS

C. P. LANDRETH

OPERATING THROUGH HIS OWN ORGANIZATION

DIRECT OXIDATION PROCESS CORP.

N. W. COR. 17th AND LEHIGH AV.

PHILADELPHIA

PENNA.

JOINTITE

A SEWER PIPE JOINT COMPOUND

No caulking is necessary with JOINTITE. Alternate joints may be poured on the bank. No skilled help required. Excludes ground water, thus paying for itself.

7 CATALOGS

on Airlock Apparatus for Sewers and Sewage Disposal

Catalog No. 22—Flush Tank Siphons. Water Regulators.
Catalog No. 25—Automatic Siphons for Domestic Septic Tanks.
Catalog No. 21—Pneumatic Sewage Ejectors.
Catalog No. 29—Sewer Pipe Joint Compound.
Catalog Nos. 23 and 24—Automatic Siphons for Large Municipal Disposal Plants, etc.
Catalog No. 27—Imhoff Tanks.

Marlo "Mud Hog" for Pumping Sludge, Bull'n 34

Catalogs mailed on request.

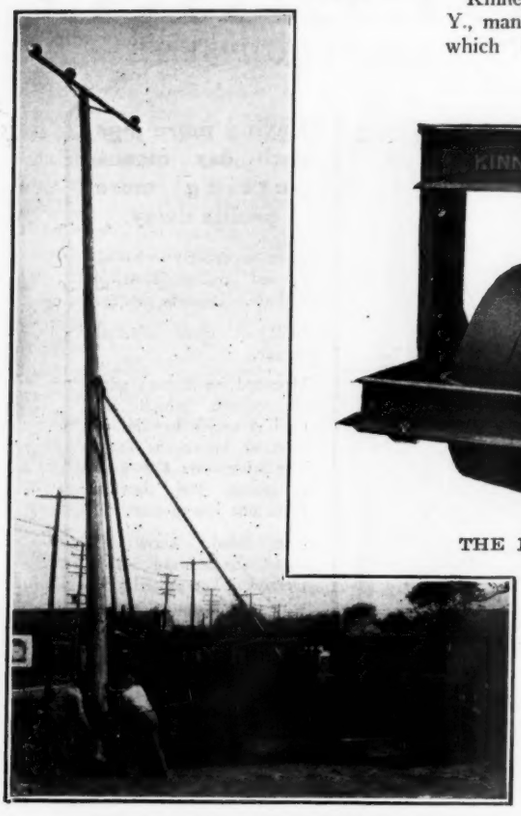
PACIFIC FLUSH-TANK CO.

4241 Ravenswood Avenue Chicago

Singer Building New York

CENTRAL FLOOR PLATES

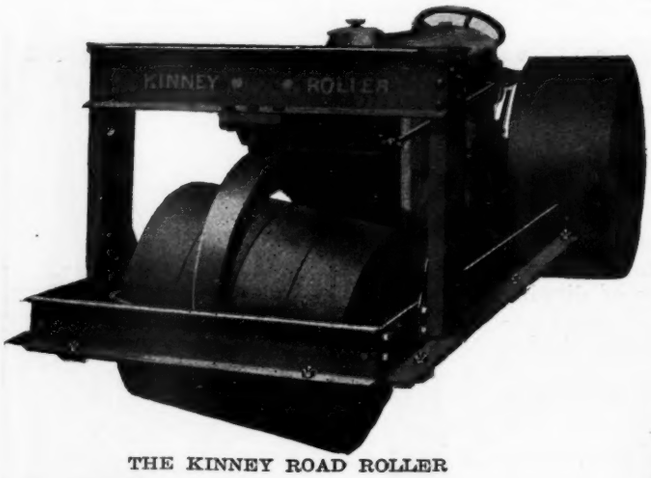
The Central Iron & Steel Co., Harrisburg, Pa., manufactures the "Central" Floor Plate, which is made of high-grade open-hearth steel. Copper bearing steel may be used if desired, which resists corrosion. The projections on these plates have been designed to prevent slipping in any direction. At the same time the projections, which consists of a raised button and a diamond, are exceptionally easy to keep clean. "Central" plates are made in any desired thickness up to 2 inches. Among the uses to which they are put are boiler room floors, rolling mills, freight platforms and the plates from the platforms to the freight car, ramps, bridges, sidewalks, gutter covers, car and bus platforms, running boards, stadium floors, temporary tracks over lawns and soft ground for trucks, and covering of temporary driveways out of excavations. These plates are Underwriters' Laboratories Inspected S. A. 443.



SETTING POLE WITH INDIANA TRUCK

KINNEY ROADROLLER

Kinney Standards, Inc., Brooklyn, N. Y., manufactures the Kinney Roadroller, which is the Fordson tractor body equipped with a structural steel roller frame and wheels. The Roadroller is made in weights of 2, 3, 4, 5, or 6 tons. The frame clamps to the Fordson unit, requiring no drilling or special work. Steering is by the regular tractor steering wheel. This roller is especially adapted to compacting foundations, subgrades and embankments, and for all rough work. Rubber tired or other special wheels may replace the regular rear rolls when an independent scarifier or other equipment requiring maximum traction is operated.



THE KINNEY ROAD ROLLER

The maximum height of the standard roller is 52 inches; length, 12 feet; roll path, 61 inches; front rolls are 28 inches in diameter and 32 inches wide; rear rolls are 42 inches in diameter and 16 inches wide.

O. K. PORTABLE ELEVATOR

The O. K. Clutch and Machinery Co., Columbia, Pa., manufactures the O. K. Portable Elevator, which is a complete unit for raising materals in building or other construction. As compared to the usual wooden tower, there is a considerable saving in time and money. It is stated that this elevator can be hauled to the job on a truck, and unloaded and erected to a height of 23 feet in two hours, exclusive of moving time. If greater height is required, 10-foot sections can be added easily and quickly.

O. K. PORTABLE ELEVATOR

This elevator consists of a steel base section, on which the hoisting mechanism is mounted, and an upright steel frame. The platform travels clear of the guides so that the load may extend over the platform sides, if necessary. Up to 26 feet the elevator is self-contained and requires no bracing or attaching to the building. Five and ten-foot additional lengths are furnished so the tower may be extended as desired. There are two engine sizes, 8 h.p. and 12 h.p.; the former has a capacity of 1,200 pounds at 125 feet per minute; the latter will handle 1,800 pounds at 150 feet per minute.

MIAMI SCRAPER

The Miami Trailer-Scraper Co., Troy, O., manufactures the Miami One-Man

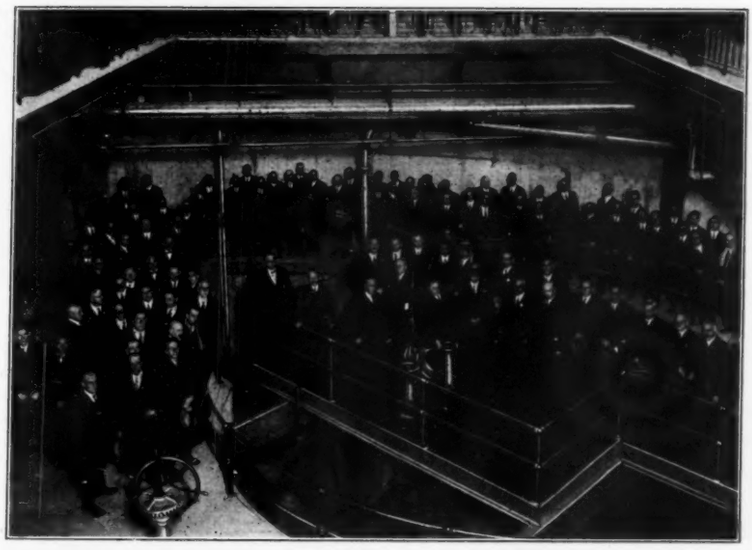
THE "CENTRAL" FLOOR PLATE

MIAMI ONE-MAN POWER SCRAPER

New York City's

LARGEST SEWAGE TREATMENT PLANT
Located in
Jamaica, Borough of Queens

Official Opening



December 15th, 1926

THE SANITATION CORPORATION
Graybar Building, 420 Lexington Avenue, New York City
"Every Branch of Sanitation"

For Engineers:—
HOME SEWAGE DISPOSAL
By W. A. HARDENBERGH
Associate Editor of Public Works

It fulfills a long existing need in supplying reliable facts and information for engineers, city officials and others who are interested in solving sewage disposal problems for single homes, small communities, and institutions. It stands alone as the only engineering book covering thoroughly the problem of sewage disposal of unsewered communities. Chapters on small septic tanks, small Imhoff tanks, secondary treatment, construction, etc.

82 illustrations; 280 pages. $3.50.

Order from
Book Department, Public Works
243 West 39th Street, New York

If it does not meet your requirements, return it and your money will be refunded.

Liquid EBG Chlorine

For Sewage Disinfection

Electro Bleaching Gas Co.
PIONEER MANUFACTURERS of LIQUID CHLORINE
Plant: NIAGARA FALLS, N.Y.
Main office 9 East 41st Street New York

"WATCH DOG"
WATER METERS
Disc Current and Compound Types

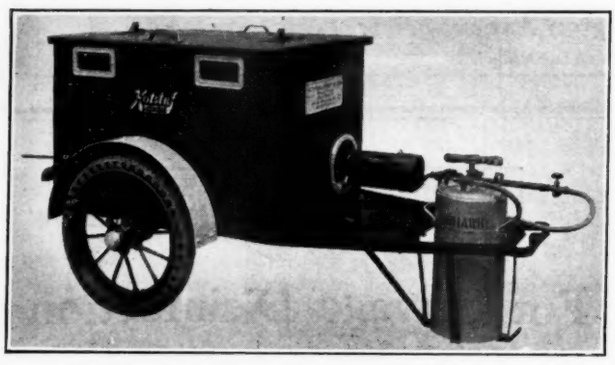
GAMON METER COMPANY
280-294 South Street NEWARK, N. J.

Power Scraper, which is claimed to be the most flexible dirt moving equipment now available. Originally designed for use with the Fordson tractor, power winches have been developed so that the scraper may be used with the 10-20 McCormick-Deering tractor, and with the 2-ton Caterpillar tractor. Through the Miami power winch, the operator has complete control of the scoop, which can be raised, lowered and dumped, as desired.

The model just announced is similar to the Fordson operated scraper, except that the scraper capacity has been increased to ¾ yard.

RUBBER TIRED HIGH SPEED ASPHALT HEATER

The Mohawk Asphalt Heater Co., Schenectady, N. Y., has brought out an improved high speed "Hotstuf" heater. This heater has special length roller bearings, an extra strength axle, and is equipped with Firestone demountable cushion tires. In addition to heat guards of heavy construction, the tires are compounded especially to withstand high temperatures. By means of these improvements, it is possible to trail this heater at high speed, without danger of damage, thus adding to the value of the equipment by saving time and labor costs, and increasing the mobility of the unit.



"HOTSTUF" ASPHALT HEATER

Further information regarding this new heater can be obtained from *Public Works*, or from the Mohawk Asphalt Heater Co., 56 Weaver St., Schenectady, N. Y.

INDUSTRIAL NOTES

BLAW-KNOX PURCHASES MILLIKEN BROS. MFG. CO.

The Blaw-Knox Company, with general offices at Pittsburgh, Pa., and with plants at Blawnox, Pa., and Baltimore, Md., has purchased the Milliken Brothers Manufacturing Company, of New York. The consolidation of the two companies became effective on September 1. The Blaw-Knox Company manufactures a line of steel specialties including steel forms for concrete construction, steel transmission towers, automatic concrete measuring devices, steel bins, clamshell buckets, etc. The products of the Milliken Brothers Manufacturing Company are transmission towers, radio towers and standard steel buildings. A considerable amount of the business of the Milliken Brothers Manufacturing Company has been in the export field, and the present Milliken organization will continue to function in this field and in addition will take over the management of the export business of the Blaw-Knox Company on all of its products. The Blaw-Knox Company will continue with its present organization to handle domestic business and the acquisition of the Milliken Company will make no change in this line. Manufacturing for both companies will be concentrated at the Blaw-Knox Company plants at Pittsburgh and Baltimore.

GILLETTE PUBLISHING CO.

The Engineering and Contracting Publishing Co., Chicago, Ill., has changed its name to the Gillette Publishing Co.

AEROIL BURNER CO., INC., MOVES

The Aeroil Burner Co., Inc., has moved to a newer and more complete plant at Park Avenue, 13th and 14th Sts., West New York, N. J.

DORR COMPANY EXPANDS SERVICE FACILITIES

For the purpose of giving its customers specialized assistance in connection with the installation and initial operation of its equipment, the Dorr Company Engineers, of New York City, have established a service department which will be in charge of H. A. Linch, who has been associated with the Dorr Company for eight years and has had a wide and varied experience in chemical, metallurgical and industrial operations, not only in this country, but also in South America and Europe.

He will be assisted in this work by a staff made up of men who have had many years of field experience with all types of Dorr equipment and who are especially qualified to give the users of this equipment high grade service.

A. Anable, for many years connected with the Equipment Sales department of the Dorr Co., has been appointed Director of Publicity of that company.

H. O. Seymour, a director of the Chain-Belt Co., Milwaukee, Wis., died July 23.

Miss E. L. Beller has been elected secretary of the National Paving Brick Manufacturers' Association. Miss Beller, who is widely known in advertising circles, was formerly assistant treasurer of the Association, and she still retains this position.

TRADE PUBLICATIONS

(*Continued from page* 40)

catalog describing in detail these speed reducers, which are furnished in three standard units to cover a wide range of ratios and reductions, ranging from 10 to 1 to 130 to 1. These units have a minimum number of parts and are equipped with Timken bearings. Lubrication is very thorough.

Water Controlling Apparatus. Rodney Hunt Machine Co., Orange, Mass. Catalog No. 32. Illustrated. 124 pages.

This is the first new looseleaf section of the Rodney Hunt general water power catalog, being the 5th edition of the water control apparatus catalog. It presents in complete detail and in a very usable form data on floor stands, gate hoists, sluice gates and valves, timber gates, trash racks, and other accessories. The first section contains much valuable engineering information, including many alinement charts for solving some of the hydraulic problems involved in the flow of water, and tables of hydraulic data. It is stated that the charts will give values accurate to within one per cent. Other alinement charts cover the problems involving speeds of belt-connected pulleys and horsepower transmitted by shafting. The catalog will be sent free on application, as will extra copies of the charts or tables.

Texaco Road Surfacing Materials. The Texas Co., N. Y. Ill. 24 pp. This booklet describes methods of maintaining earth, sand-clay, gravel, macadam, shell, cinder, and similar road surfaces with Texaco products. These products vary from a light dust-layer containing approximately 30 per cent of asphalt to a product containing 86 per cent of asphalt, which must be heated before application to the road surface. A series of useful tables for the road builders adds to the value of the booklet. Copies may be obtained from the Texas Co., 17 Battery Place, N. Y.

Belt Conveyor Data Book. Link-Belt Co., Chicago. 144 pp. Ill. This book, No. 615 of the Link-Belt series, contains a great amount of engineering data, and many valuable formulas, some not previously published. It should prove a valuable handbook of reference on belt conveyers. It really goes hand in hand with the Link-Belt Typical Elevator Book (No. 680) and the Link-Belt Silent Chain Drive Data Book (No. 125). In each of these three publications, fundamental facts and figures are so arranged and tabulated as to make it easy for the prospective or potential user of such equipment to do his own selecting and designing.

Imhoff Tanks and Separate Sludge Digestion. The Chemical Foundation, Inc. Distributed by the Pacific Flush Tank Co., Chicago and New York. This bulletin, No. 31, contains two interesting papers, one on Imhoff tanks by Harrison P. Eddy, and one on separate sludge digestion by Dr. Willem Rudolfs. There are also two pages of designs of Imhoff tank operators' tools.